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ABSTRACT

Designed to supplement the mathematics-science curriculum, this booklet contains activities which provide students of grades three and four with opportunities for investigating science and applying mathematics skills on the topics of the human body and foods. The exercises are written to meet a variety of lesson needs: to introduce a concept, to enrich and extend, or to conclude, a concept. Ten mathematics skills and nine science skills are listed and indexed for the nine activities on the human body and nine activities on foods. Each activity consists of student sheets and a teacher's guide. The teacher's guide contains information on the activities including: (1) topic area; (2) introductory statement; (3) math and science skills; (4) required materials; (5) key questions; (6) background information; (7) management details; (8) instructional procedures; (9) student procedures; (10) discussion questions; (11) activity extensions; and (12) curriculum coordinates. (ML)

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JAW BREAKERS AND HEART THUMPERS

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3–4 BOOK A

SE 048 228

PROJECT AIMS

JAW BREAKERS AND HEART THUMPERS

A Study in
Fun Foods and Body Basics

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Project AIMS

Project AIMS has as its purpose the integration of subject matter in K-9. Such integration enriches and makes learning meaningful and holistic. Project AIMS began as a program to integrate mathematics and science, but has since developed to also include language arts, social studies, and other disciplines. The acronym "AIMS" stands for "activities to integrate mathematics and science."

Project AIMS is a continuing, non-profit project of Fresno Pacific College. It had its inception in a National Science Foundation funded program to train teachers in the integration of mathematics and science. This quickly created the necessity to write instructional materials incorporating this concept. Despite the fact that thoughtful educators have long recommended this approach, very little appropriate material was available.

Currently, Project AIMS is funded solely through the sale of this developing series of books. All net proceeds from their sale flow into a trust fund administered by Fresno Pacific College. The use of this fund is restricted to the support of continued research and development, partial scholarships for classroom teachers who participate in the writing and field testing teams, and the publication of the books.

Two writing teams have completed their work. The first consisted of seventy-five teachers in grades 5-9 who met over a period of eighteen months. The second involved thirty-five K-4 teachers who wrote during a two-year span. In the fall of 1985 a third team of approximately fifty teachers in grades 2-9 will begin writing. In addition, over a hundred teachers have been involved in field testing newly created materials.

The rationale for this integrative thrust lies in the fact that science, mathematics, language arts, social studies, etc., are integrally interwoven in the real world outside the classroom, from which it follows that they should be similarly treated in the classroom if we are to prepare our students for life in that world. Teachers who have used Project AIMS lessons give enthusiastic endorsement to the effectiveness of this approach.

Science encompasses the art of questioning, investigating, hypothesizing, and discovering. Mathematics is the language that provides clarity, objectivity, and understanding. The language arts provide us with powerful tools of communication. Many of the major contemporary issues involve societal issues stemming from advancements in science. It is time, therefore, that all of us in the teaching profession take seriously using a more holistic mode of transmitting knowledge to students. It is this that motivates all of us who are involved in creating or using the integrative materials of Project AIMS. We invite you to join us in this effort.

Extensive field testing of these materials confirms the following beneficial results.

1. Mathematics becomes more meaningful, hence more useful, when it is applied to situations that interest students.

2. The extent to which science is studied and understood is increased, with a significant economy of time resulting from the integration of two or more disciplines.

3. There is improved quality of learning and retention, supporting the thesis that learning which is meaningful and relevant is more effective.

4. Motivation and involvement are increased dramatically as students investigate real world situations and participate actively in the process.

We invite you to become part of this classroom teacher movement by using an integrated approach and by sharing any suggestions you may have or investigations you would recommend. Project AIMS welcomes you!

Project AIMS Publications

GRADES 5-9 SERIES

Math + Science, A Solution
The Sky's the Limit
From Head to Toe
Fun With Foods
Floaters and Sinkers
Down to Earth
Our Wonderful World
Pieces and Patterns, A Patchwork in Math and Science
Out of This World, Book A

GRADES K-4 SERIES

Fall Into Math and Science
Glide Into Winter With Math and Science
Spring Into Math and Science
Seasoning Math and Science, Book A (Fall and Winter)
Seasoning Math and Science, Book B (Spring and Summer)
Jawbreakers and Heartthumpers
Hardhatting in a Geo-World
Popping With Power
Overhead and Underfoot

FOR FURTHER INFORMATION WRITE TO:

AIMS Education Foundation
5629 East Westover Street
Fresno, California 93727

I HEAR, AND I FORGET
I SEE, AND I REMEMBER
I DO, AND I UNDERSTAND

–Chinese Proverb

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Introduction

Jaw Breakers and Heart Thumpers combines math skills and science processes in exciting, fun-filled, time saving lessons. We chose for our first book the topics of human body and foods because they are naturally interesting and motivating for students.

The investigations in this book provide students with experiences from their real world that teach the skills necessary to find out answers to such questions as: Are candy products produced uniformly? How many pounds per square centimeter do your feet support? What is the average number of teeth in your class? What is the dehydration rate of fruits? What is the size of the average 9 or 10 year old?

We chose to concentrate on science processes because they provide a life skill for finding answers. Content alone is too restrictive. With the Project AIMS approach students learn to predict, observe, investigate, generalize, interpret data, and to think critically. Students have fun being a scientist while applying learned math skills in practical and meaningful situations. This book is written so that any investigation may be used for a variety of lesson needs: to introduce a concept, to enrich and extend, or as a concluding activity for a concept. Key questions are used to motivate students to begin each investigation. Math skills and science processes are listed in each lesson and in the index table. Suggestions are given for management techniques and curricular extensions. Each lesson provides a list of materials needed, step by step procedures and background information.

Project AIMS is an expanding idea, a springboard for further inquiry. Please feel free to adapt these lessons to fit your classroom needs or teaching style. Be adventurous and share in the discovery process with your students. We hope you catch the enthusiasm with which the investigations in Jaw Breakers and Heart Thumpers were prepared.

DUPLICATION RIGHTS AND RESTRICTIONS

The AIMS Education Foundation is a non-profit, tax exempt corporation. All net proceeds from the sale of Project AIMS materials are used to sustain its program of research, development, publication, dissemination and education.

The Foundation is devoting every effort to making its materials and educational programs affordable. With respect to publications this takes the form of offering books with reproducible lesson material at a reasonable initial cost and then granting generous duplication rights. But, there are restrictions to the duplication rights that must be strictly observed.

The primary means of support for the Foundation comes from the sale of materials. Therefore, strict observtion of these duplication rights is essential for the Foundation to continue to make its contribution to education.

The conditions and restrictions are as follows:

1. A teacher or school purchasing AIMS books may make up to 200 copies of the materials for classroom use within that school. It is the intent of this permission that each school within a district will purchase the books it intends to use.

2. Where school districts wish to use the program districtwide and duplicate the materials in the central office, reproduction rights for making more than 200 copies may be purchased from the Foundation. For information, contact the Foundation office.

3. Where Project AIMS materials are used for workshops, conferences, and courses (other than within a school district) special restrictions apply.
   These are:

   a. No more than a total of 200 copies may be reproduced without special arrangements with the AIMS Education Foundation.

   b. Each page or collection of pages must have the statement "Used with the permission of the AIMS Education Foundation, P.O. Box 7766, Fresno, California 93747. Reproduction rights to these copies of the original is limited to 30 copies for classroom testing only."

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AIMS Newsletter Subscription Information

Each issue of the AIMS Newsletter contains a wealth of resources consisting of new AIMS integrated mathematics/science investigations, simple science experiments, and problem solving mathematics activities.

The AIMS Newsletter is published monthly, August through May. Subscriptions are on an annual basis only. A subscription entered at any time will receive the 10 issues for that year beginning with the previous August issue. This format is used since many of the articles in an annual volume are interrelated and all need to be available for maximum benefit.

The average issue of an AIMS Newsletter contains four or more new AIMS investigations, at least one each at the K-2, 3-5, and 6-9 grade levels; one 8.5 x 11 inch blackline master poster describing a simple science experiment; two 8.5 x 11 inch blackline master posters displaying problem solving situations; information about developments in the AIMS program, workshops, courses, and other activities; feature articles of lasting value dealing with science instruction problem solving in mathematics, etc.; a description of how a school, district, or state is implementing AIMS in a systemmatic manner; activities by members of the AIMS National Leadership Network and the writing teams; a thorough preview of all new AIMS and SETUP publications; information about conference presentations by the program directors of AIMS where participants can meet with them personally; and a periodic listing of all AIMS publications.

The problem solving poster series in the Newsletter is accompanied by a thorough analysis of problem-solving approaches appropriate to each situation. This analysis serves as an aid to classroom teachers who wish to enhance their own knowledge of problem solving and helping students acquire an inventory of problem-solving skills. Authored by Wilbert Reimer and Arthur Wiebe, both of whom studied extensively under Dr. George Polya at Stanford University, both series reflect his influence.

The ten issues in the annual volume contain forty or more new AIMS investigations, ten science posters, and twenty problem-solving challenges, plus numerous articles dealing with the teaching of "hands-on" science, evaluating higher order thinking skills and student progress in mastering process skills, and other enriching resources.

Since duplication rights for one school site are granted for all materials published in the Newsletter, it is highly cost effective for a school to enter a subscription and build a library for the use of all of its teachers.

The annual subcription price is $22.50. The entire first volume of ten issues (1986-7) is still available for $22.50. Schools purchasing the first volume and entering a subscription for the second year (1987-8) may do so at the reduced price of $40.00 for both. The number of sets of Volume 1 is limited, however, and early purchase is recommended.

AIMS Newsletter Subscription Form

The AIMS Newsletter is published monthly, August through May. All subscriptions are on an annual basis only. A subscription entered at any time during the year will include all issues of that year beginning with the previous August issue.

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____ Purchase of 1986-7 packet (Volume 1), $22.50

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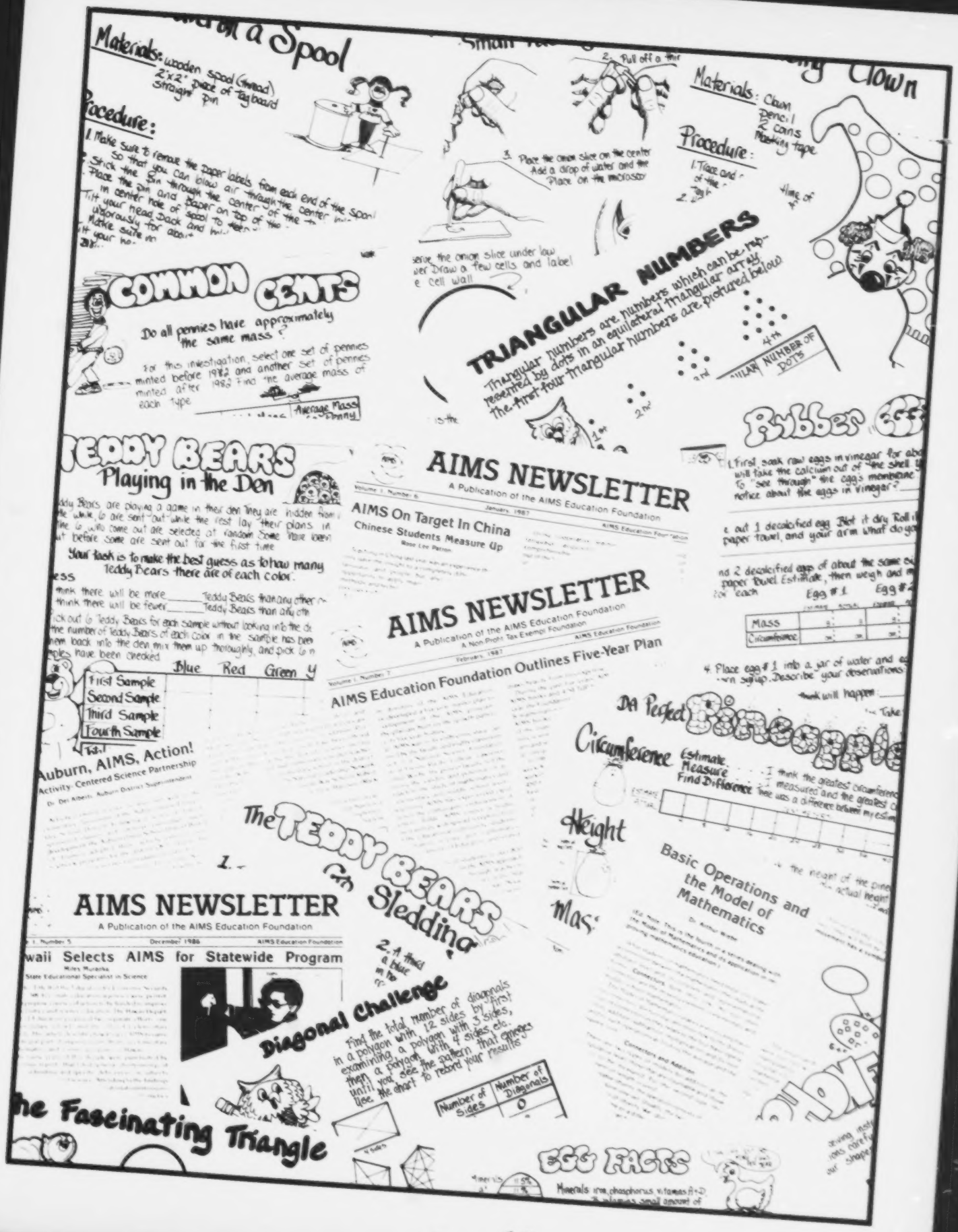
Materials: wooden spool (thread)
2"x2" piece of tagboard
straight pin
Procedure:
Materials: Clown
Pencil
2 coins
Masking tape
Procedure:
COMMON CENTS
Do all pennies have approximately the same mass?
TRIANGULAR NUMBERS
Triangular numbers are numbers which can be represented by dots in an equilateral triangular array. The first four triangular numbers are pictured below
TEDDY BEARS
Playing in the Den
Your task is to make the best guess as to how many Teddy Bears there are of each color.
Blue Red Green
First Sample
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A Publication of the AIMS Education Foundation
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Hawaii Selects AIMS for Statewide Program
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Number of Sides
Number of Diagonals
Basic Operations and the Model of Mathematics
The Fascinating Triangle
EGG FACTS

AIMS Education Foundation Programs

The AIMS Education Foundation sponsors a variety of programs and services. Write for additional current information about any of these:

AIMS National Leadership Program in Math/Science

The Leadership program provides training in science and mathematics for teachers in grades K-9 using the AIMS integrated mathematics/science approach. Intensive training is provided in the physical, biological, earth science, and mathematics topics and the science process skills.

Participants receive 300 hours of instruction in a two-summer sequence. During each academic year following, the participant provides a minimum of 50 hours of instruction to teachers in the local district or region.

Upon successful completion of these requirements, trainers qualify to become members of the AIMS National Leadership Network, conduct AIMS workshops, teach AIMS in-service courses for college credit, and serve as AIMS consultants to help meet the widespread demand for such services.

The program the first summer consists of the AIMS National Leadership Institute (two weeks in early July) and the Science Festival (two weeks in late July). The second summer schedule includes the Festival of Mathematics (two weeks in late June) and a second AIMS National Leadership Institute (two weeks in early July).

AIMS One-Week Summer Workshops

The AIMS Education Foundation will offer 30 or more one-week AIMS Workshops nationally each year. The sites are selected from applicant educational organizations who wish to serve as the hosts. Each workshop is of five days duration and includes 30 hours of instruction, primarily hands-on, in AIMS. All are offered in three or more grade level sections, generally K-1, 2-4, and 5-8. Participants receive $40+ in materials.

Host agencies agree to provide appropriate classroom space and related services at no cost to the Foundation and to cooperate in the promotion of the workshop. This is the only cost to the host agency. The AIMS Education Foundation pays all instructional costs; the housing, meals, and travel of instructors; and workshop materials and supplies. During 1988 the cost per participant is $170. Instructors are members of the AIMS National Leadership Network.

Educational agencies interested in making application to host a workshop should request current information and application forms.

AIMS On-Campus Workshops

Each summer AIMS offers four one-week AIMS workshops at Fresno Pacific College in Fresno, California. The program directors of the AIMS Education Foundation and key members of the AIMS National Leadership Network serve as instructors. Two semester units of graduate credit are available.

Science Festival and Festival of Mathematics

Fresno Pacific College offers two outstanding programs each summer: the Science Festival and the Festival of Mathematics. Guest faculty include some of the nation's most highly regarded mathematics and science educators. Provision is made for all grade levels from Kindergarten through high school.

These two Festivals offer a unique educational experience and annually draw a total enrollment of more than 500 teachers from across the nation.

"Saturday with AIMS"

"Saturday with AIMS" offers an intensive one-day AIMS workshop to introduce teachers to AIMS and its philosophy. Participants will become familiar with the basic principles incorporated into AIMS; engage in an extensive series of hands-on AIMS investigations; and discuss classroom management and methods for integrating AIMS into the curriculum. Participants receive more than $30 worth of materials, including their choice of two AIMS publications. These workshops can be offered **in any part of the nation** based on a minimum enrollment of 30 participants. The cost is $65 per person.

Information Request

Please send current information on:

____ AIMS National Leadership Program
____ AIMS On-Campus Workshops
____ AIMS Off-Campus Workshop Schedule
____ Science Festival
____ Festival of Mathematics
____ "Saturday with AIMS" Schedule
____ "Saturday with AIMS" hosting information

Name: _____

Address: _____
Street *City* *State* *Zip Code*

Mail to: **AIMS Education Foundation, P.O. Box 7766, Fresno, CA 93747**

Are you an Average Joe?

I. **Topic Area**

Variation in size of people

II. **Introductory Statement**

The children will learn that there is variation of life on earth.

III. **Math Skills**

a. Averaging
b. Estimating
c. Graphing
d. Measuring

Science Processes

a. Measuring
b. Gathering and recording data
c. Interpreting data
d. Generalizing

IV. **Materials**

Large pieces of butcher paper
Meter tapes for measuring (transparency meter tapes work very well)
Pencils, crayons, and/or markers

V. **Key Question**

How do you compare to the average kid your age?

VI. **Background Information**

1. It might be necessary before hand to teach variation as a vocabulary word, and do some work with averaging in math.
2. Define the exact sections to be measured so the kids have definite beginning and ending points. (ex. ankle bone to bottom of knee cap)
3. This works best if the kids are wearing light clothing.

VII. **Management**

1. One 50 minute class session to trace bodies, go over outline with markers, and make measurements.
2. A second 50 minute class session to determine the average size of each measurement, and construct the "average person."
3. A short 30 minute follow-up session to compare your measurements to the "average" model and determine how much variation you represent.

VIII. **Procedure**

1. Cut large pieces of butcher paper for body tracings (enough so each child has one).
2. Arrange for a large enough area to make tracings. Could use floor of cafeteria or gymnasium.
   a. An option might be to have the kids do tracings and measuring a pair at a time in back of the room while regular instruction continues.
3. Make or collect tapes for the kids to measure with. A class of 30 would need 15 meter tapes.

IX. **What the Students Will Do**

1. Ask the class whether or not they think kids their age are all the same size.
   a. Could also ask if they all have the same arm and/or leg length, etc.
2. Tell the kids they will be participating in an investigation to find out how much variation there is between them, and construct an average kid their age.
3. Divide the class into pairs. Each set of partners will be doing the following:
   a. One partner lies down (face up) on piece of butcher paper while other traces their body (paying careful attention to details, such as fingers) with pencil. Go over tracing with crayon or marker, then switch places.
   b. (With meter tape) each child measures the length or width of the following, and records on butcher paper.
      1. arm (wrist to arm pit)
      2. leg (ankle bone to bottom of hip)
      3. length of longest finger
      4. foot (ankle bone to tip of longest toe)
      5. waist width
      6. width of widest part of head
      7. width of leg at thickest part
      8. width of arm at thickest part
   c. Transfer measurements to student worksheet.
4. In next session work with same partner and compare all measurements. Figure average of each for you and your partner.

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5. With whole class add up all partners' averages to get an average of each measurement for the whole class.
6. On butcher paper a few kids can construct a drawing of the average kid in the class.
7. At the next class session find the difference between your own measurements and the average for the class.
8. Have a class discussion on the results.

X. **Discussion**

1. How much of a variation is there between you and the average?
2. Which measurements were closest to average?
3. Which were farthest from average?
4. How many kids were close to the average model?
5. What do you think the average model for other grade levels (first, sixth) might look like?
6. Would there be this same amount of variation in animals of the same age? Plants?

XI. **Extensions**

1. Choose groups to make measurements of and construct average model for other grade levels (maybe one younger and one older).
2. Collect samples of other species to compare for variation in size. Examples: leaves from the same plant, flowers from the same plant, or beans from the same package.
3. Examine a species for other characteristics to group or arrange (shape, color, etc.)

XII. **Curriculum Coordinates**

Language Arts

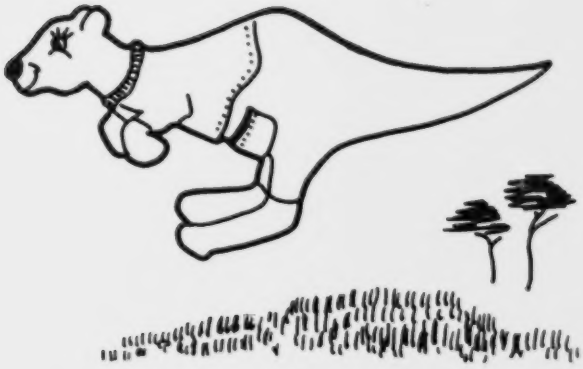
Write a description of the average individual in a species you have examined.

Music and Foreign Language

Learn the song "Alouette."

Art

Construct a three-dimensional model of Mr. or Ms. Average, using papier-mache and plaster of Paris.



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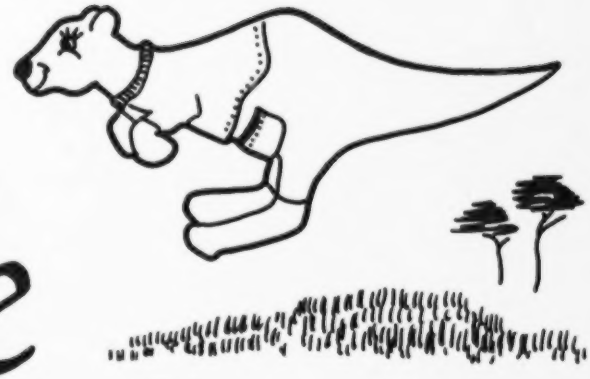
NAME _____



Are you an Average Joe?

FIND OUT HOW YOU COMPARE IN SIZE TO THE AVERAGE KID IN YOUR CLASS.

MY PARTNER IS _____

BODY PARTS	ESTIMATE OF CM. MEASUREMENT IN.		ACTUAL LENGTH IN CM		AVERAGE FOR MY PARTNER & I	CLASS AVERAGE	DIFF.
	ME	PARTNER	ME	PARTNER			
ARM							
LEG							
FINGER							
FOOT							
WAIST							
HEAD							
LEG WIDTH							
ARM WIDTH							

1. WHICH OF YOUR MEASUREMENTS WERE CLOSEST TO THE AVERAGE? _____

2. WHICH WERE FARTHEST FROM AVERAGE? _____

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HOW DO YOU MEASURE UP?

I. **Topic Area**

Human Body—Relationship of femur length to height.

II. **Introductory Statement**

Students will discover what the relationship is between their femur length and their total height.

III. **Math Skills**

a. Measuring
b. Estimating
c. Finding percent
d. Using formula
e. Rounding numbers
f. Using calculators

Science Processes

a. Observing
b. Estimating
c. Gathering and recording data
d. Interpreting data

IV. **Materials**

Centimeter tape
Meter stick
Calculators
Chart paper (graphing)
Crayons or Markers
Worksheet

V. **Key Question**

What is the relationship between a person's femur length and his height?

VI. **Background Information**

1. Some knowledge of or pictures available of the human skeleton.
2. Knowledge that the average adult's femur length is 27% of his total height.
3. Knowledge and experience using metric measurement (cm).
4. Knowledge and some experience using calculators.

VII. **Management**

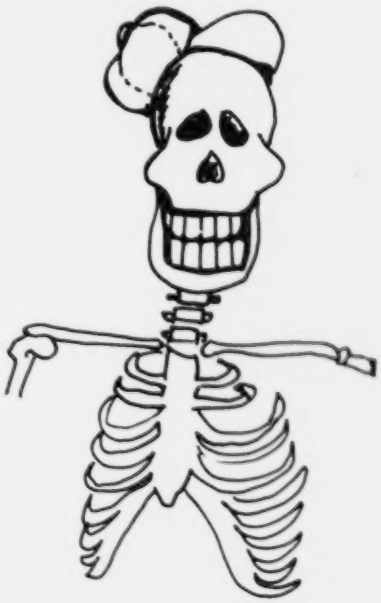
A class period of 45 to 60 minutes with 1 adult measuring the students' heights and 1 adult measuring femur lengths and assisting in operating the calculators.

VIII. **Procedure**

1. Discuss total height of an individual as 100% and estimate portion or percent that the human femur length represents.
2. Record estimate of percent of height on worksheet.
3. Measure and record student's total height in cm.
4. Have student sit up straight in a chair. Use a meter stick and measure horizontal length of femur bone from top of the leg to the front of knee. Record measurement on worksheet.
5. Briefly discuss and practice rounding off whole numbers.
6. Use the calculator with an adult helping to determine the percentage. Use the percent formula on worksheet. Record the answer in the % blank on worksheet.
7. Graph on chart paper the individual student's percent.
8. Discuss and compare class graph results. Make generalizations.

IX. **What the Students Will Do**

1. Students will estimate the relationship of the femur length to their total height as a percent and record on worksheet.
2. Students will measure and record their body height and femur length.
3. Students will use a calculator to express the relationship in percent. (Due to the fact that actual measurement of the femur will not be extremely accurate, there will be variations in the percents found, i.e. from 23% to 28%).
4. Students will graph results and make generalizations.



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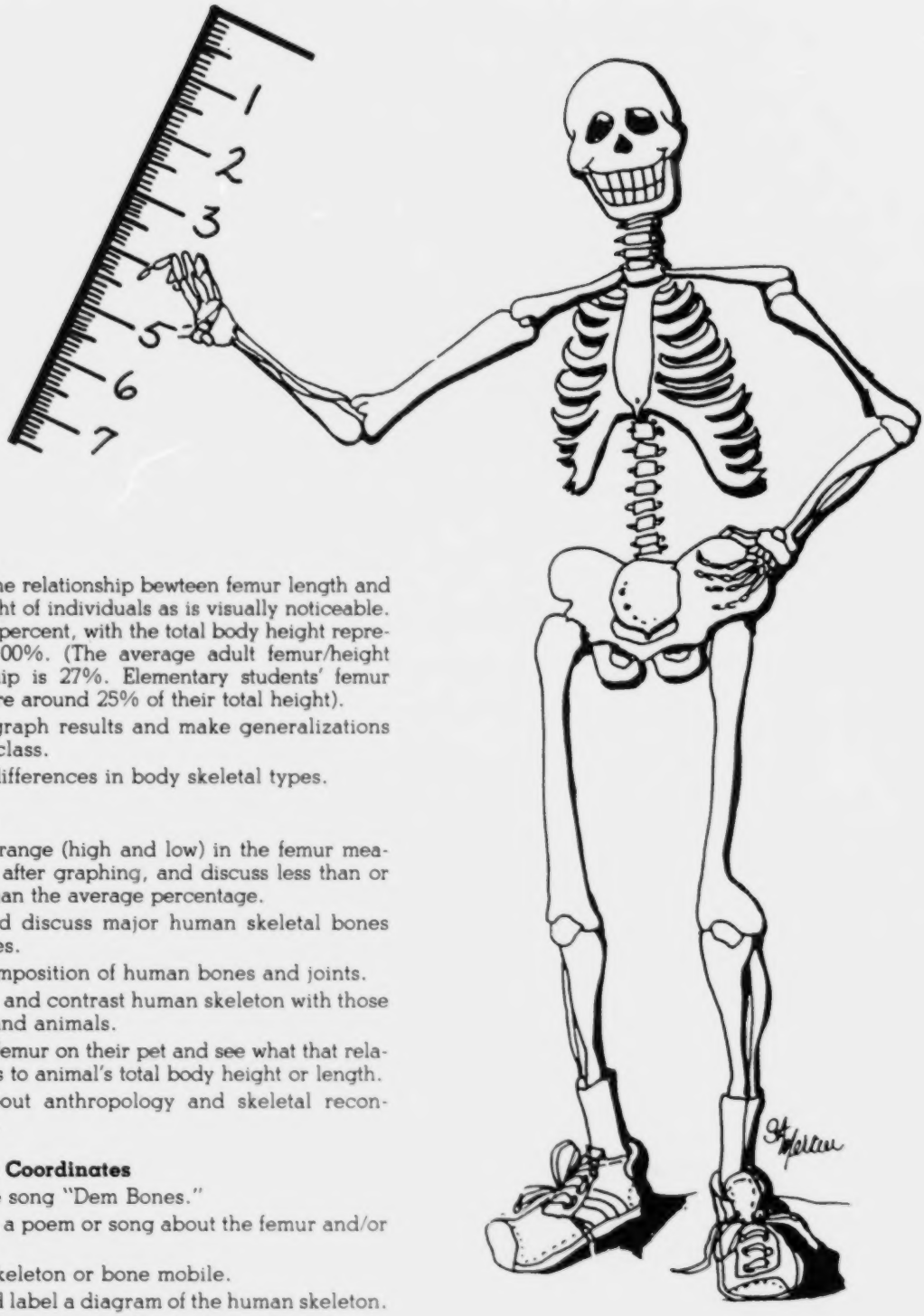

X. **Discussion**

1. Discuss the relationship bewteen femur length and total height of individuals as is visually noticeable. Relate to percent, with the total body height representing 100%. (The average adult femur/height relationship is 27%. Elementary students' femur lengths are around 25% of their total height).
2. Discuss graph results and make generalizations for your class.
3. Discuss differences in body skeletal types.

XI. **Extensions**

1. Find the range (high and low) in the femur measurement after graphing, and discuss less than or greater than the average percentage.
2. Learn and discuss major human skeletal bones and names.
3. Learn composition of human bones and joints.
4. Compare and contrast human skeleton with those of birds and animals.
5. Measure femur on their pet and see what that relationship is to animal's total body height or length.
6. Study about anthropology and skeletal reconstruction.

XII. **Curriculum Coordinates**

1. Learn the song "Dem Bones."
2. Compose a poem or song about the femur and/or skeleton.
3. Make a skeleton or bone mobile.
4. Color and label a diagram of the human skeleton.
5. Write a story about a skeleton's adventures.

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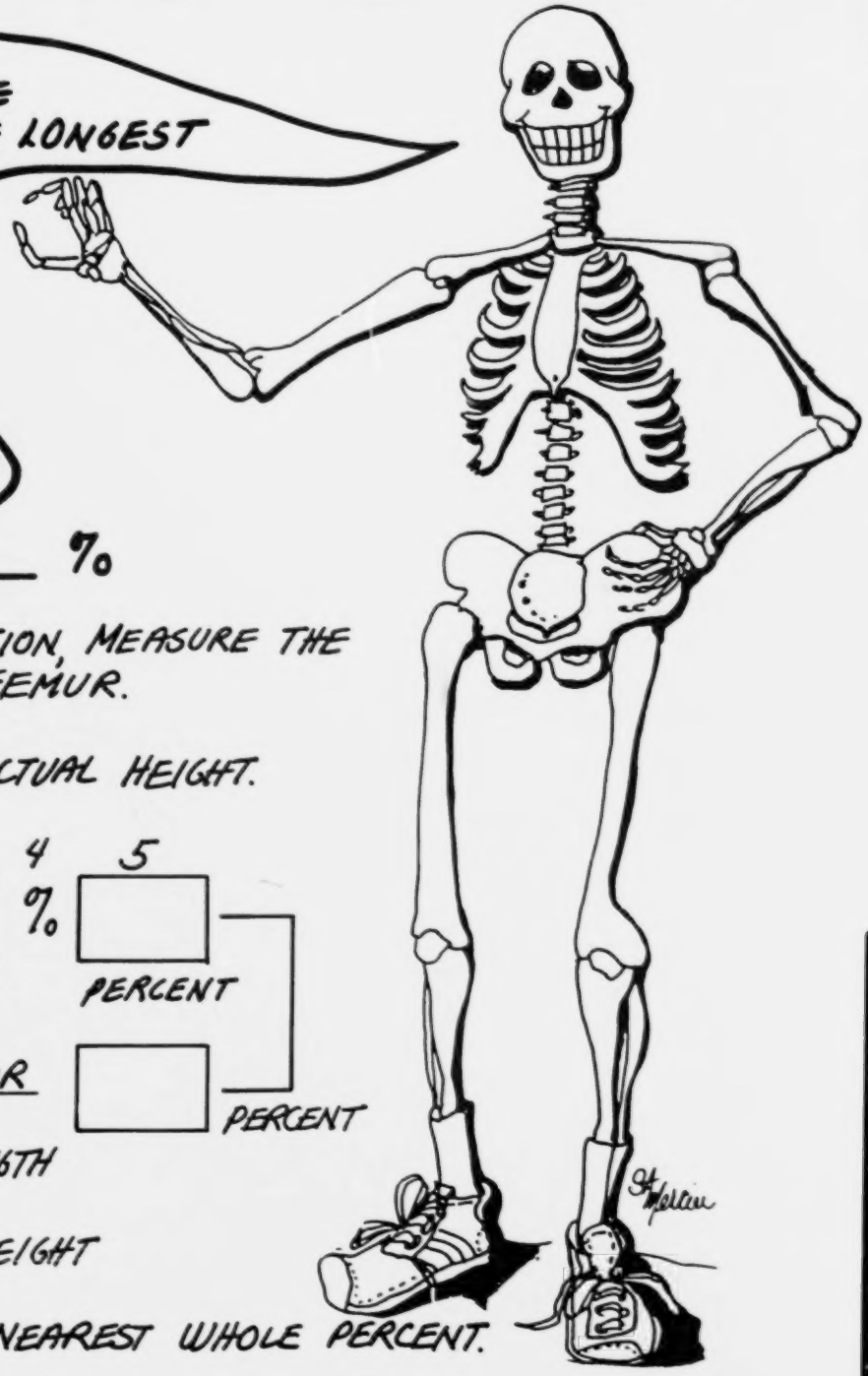
HOW DO YOU MEASURE UP?

NAME _____



THE THIGH BONE (FEMUR) IS THE LONGEST BONE IN THE HUMAN BODY

WHAT IS THE RELATIONSHIP BETWEEN THE FEMUR AND OUR ACTUAL HEIGHT?

ESTIMATE _____ %

IN A SITTING POSITION, MEASURE THE LENGTH OF THE FEMUR.

MEASURE YOUR ACTUAL HEIGHT.

1	2	3	4	5
[ ]	÷	[ ]	%	[ ]
FEMUR		HEIGHT		PERCENT

USE THE CALCULATOR [ ] PERCENT

1. ENTER FEMUR LENGTH
2. PRESS ÷
3. ENTER TOTAL HEIGHT
4. PRESS %
5. ROUND TO THE NEAREST WHOLE PERCENT.

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OUR BODY OF WATER

I. **Topic Area**

Human Body—Water Content

II. **Introductory Statement**

Students will learn how much water is in their bodies.

III. **Math Skills**

a. Measuring
b. Counting
c. Dividing—Fair shares
d. Graphing

Science Processes

a. Gathering and recording data
b. Observing
c. Measuring

IV. **Materials**

Scales
Scissors
Worksheets
Empty milk cartons 10-20 (optional)
Glue
Chips, counters, centicubes (about 70-80 per two students)
Division Boards (optional)

VI. **Key Question**

How many pounds of your body are water?

How many milk cartons would the water in your body fill up?

VI. **Background Information**

Students should have some knowledge of division or fair shares.

VII. **Management**

This activity may take two 45 minute class periods.

VIII. **Procedure**

Class Period 1

1. Weigh each student and write down weight on worksheet.
2. Working in pairs, (if you have enough counters students may work alone) each student will count out enough chips to equal his weight.
3. Divide these chips into three fair shares. Set aside any remainders.
4. Count how many chips are in two of these piles and record this on the worksheet for ⅔ of the weight. This number tells how many pounds of your body are water.

Class Period 2

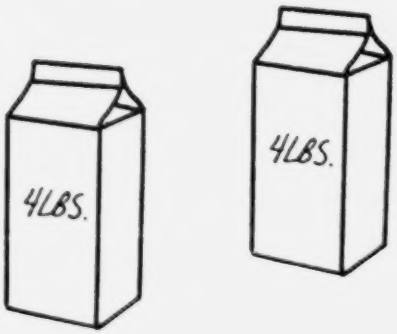
5. Using the number of pounds of water in your body divide into four fair share piles. Set aside any remainders. Count the chips in one pile. This number will tell you how many cartons the water in your body would fill up. Record on the worksheet above the carton of water.
6. Cut out the correct number of milk cartons and paste onto a class graph.
7. Have empty milk cartons on hand so students can gather up the number of cartons the water in their body filled up and compare that to their body as a whole. This is just a visual experience and not necessary to the experiment.

IX. **What the Students Will Do**

1. Weigh and record body weight.
2. Determine number of pounds of water in body.
3. Determine number of milk cartons water in body would fill up.
4. Make a graph of results.

X. **Discussion**

1. Why does everybody have a different amount of water in their body?
2. If your body is ⅔ water where is it all?
3. Make generalizations from the graph. (highest, lowest)



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XI. **Extensions**

1. Study evaporation and the human body temperature control system.
2. Find out about the water content of the human brain, blood, and urine.
3. Find out about the excretion process.
4. How does the body lose water?
5. How do sweat glands work?
6. Why do we have sweat glands?
7. Where are most of our sweat glands located?
8. How do we replace the water we lose?
9. Why must we stay wet on the inside?
0. Find out the percent of water in different foods.
11. Find out how a camel stores water.
12. Find out how plants store water.
13. Find out about sweat glands of other animals

Curriculum Coordinates

See extensions above.

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NAME _____

OUR BODY OF WATER

ABOUT 2/3 OF YOUR BODY IS WATER. HOW MANY POUNDS IS THAT FOR YOU?

A HALF GALLON CARTON FILLED WITH WATER WEIGHS ABOUT 4 POUNDS. HOW MANY OF THESE CARTONS WOULD THE WATER IN YOUR BODY FILL UP?

_____

MY WEIGHT

_____ LBS.

2/3 OF MY WEIGHT

_____ LBS.

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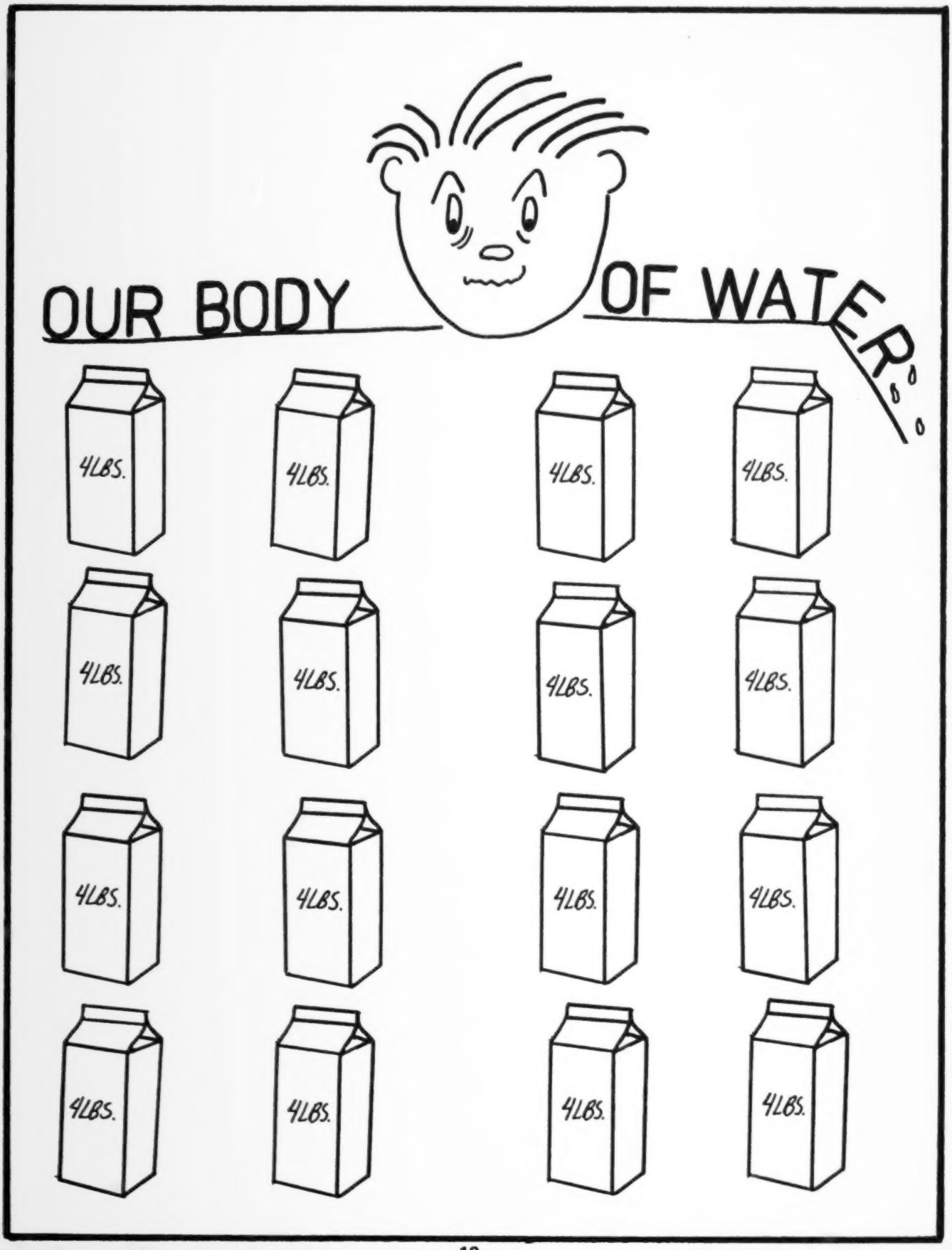

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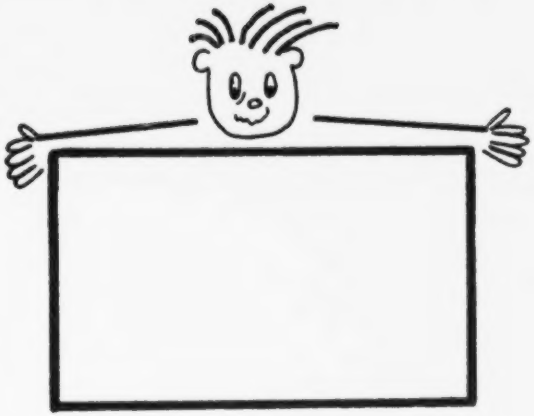

YOUR WEIGHT IN CHIPS.

1. DIVIDE INTO THREE FAIR SHARE PILES.
2. REMOVE 1 PILE.
3. YOUR WATER WEIGHT IS LEFT!

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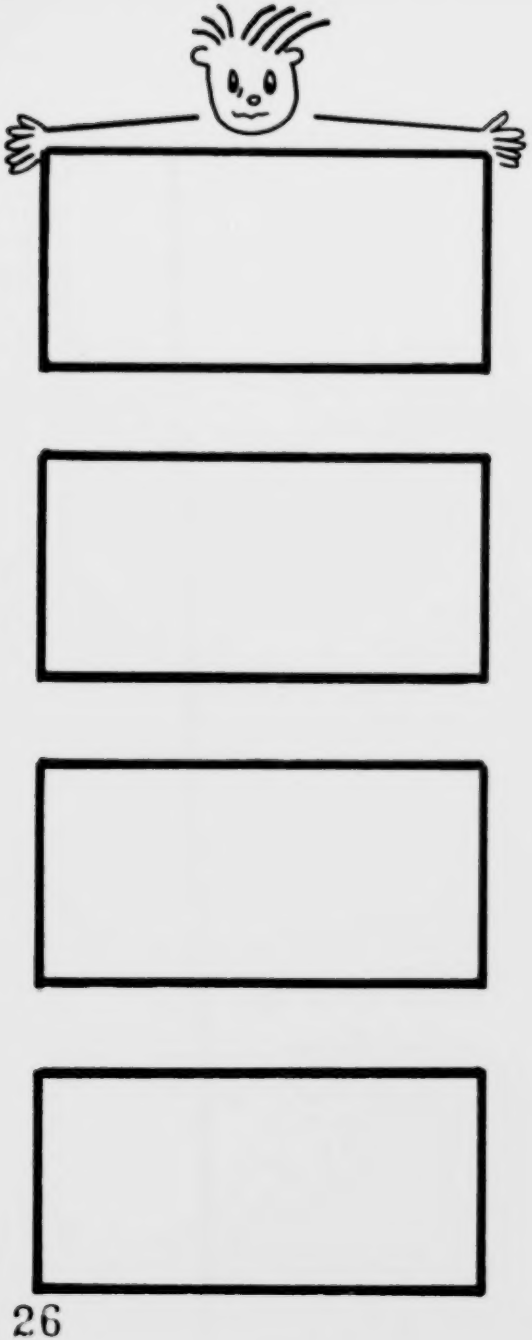

YOUR WATER WEIGHT IN CHIPS.

1. DIVIDE CHIPS INTO FOUR FAIR SHARE PILES.
2. REMOVE 3 PILES.
3. THIS TELLS YOU HOW MANY HALF GALLON CARTONS WOULD BE FILLED BY THE WATER IN YOUR BODY.

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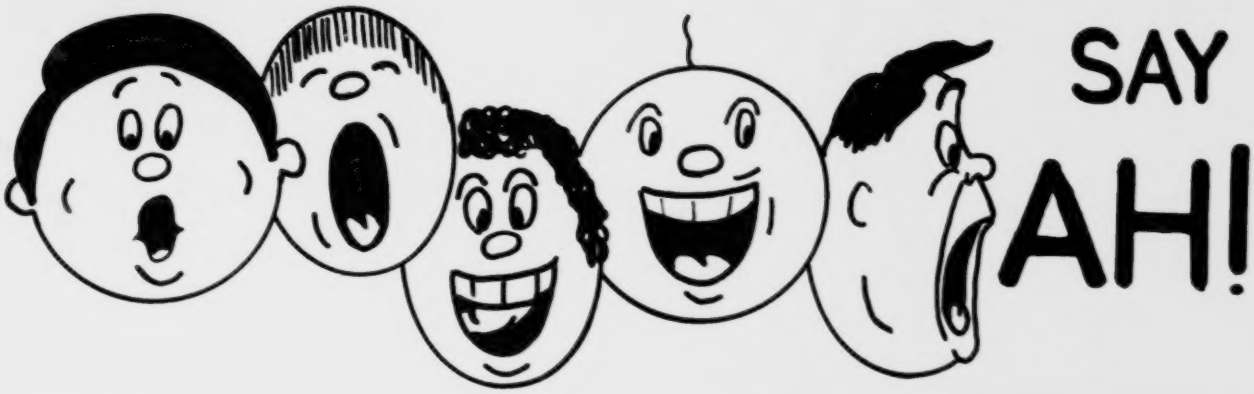


I. **Topic Area**

Human Body (teeth)

II. **Introductory Statement**

Students will learn about the number and kinds of their teeth.

III. **Math Skills**

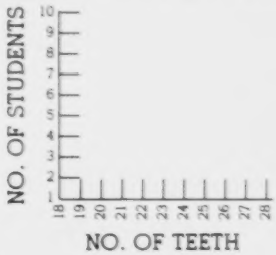
a. Counting
b. Addition
c. Finding averages
d. Graphing

Science Processes

a. Predicting
b. Observing and classifying
c. Recording data

IV. **Materials**

Mirrors for each student pair (optional)
Class graph and colored paper squares

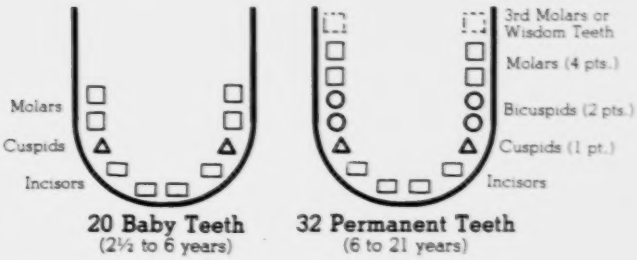


V. **Key Question**

What is your group's average number of teeth?

VI. **Background Information**

Most mammals grow two sets of teeth. Students will have a combination of baby and permanent teeth. The number and kinds of each are shown below.



20 Baby Teeth
(2½ to 6 years)

32 Permanent Teeth
(6 to 21 years)

The three basic functions of teeth are to bite and chew, to speak, and to support facial muscles.

Incisors cut like scissors, cuspids cut and shred, bicuspids tear and grind, and molars crush and grind.

VII. **Management**

1. This activity will take about 60 minutes.
2. Partners will count each other's teeth. Then rotate partners to double-check results. Groups of four or six will record their data. Mirrors may be used.
3. Do not put up the numbered class graph until predictions have been made.

VIII. **Procedure**

1. Discuss counting *accurately*. Count teeth on the sides rather than from the top. If the tooth shows above the gum, it counts.
2. Make a class bar graph of each student's total teeth. Give each student a paper square which they will glue onto a class graph above the appropriate total.
3. Averages will often have remainders. These can be expressed as a remainder, fraction, or rounded number.

$$\begin{array}{r} 22 \text{ r}2 \\ 4\overline{)90} \end{array} \text{ or } 22\tfrac{2}{4} \text{ or } 23$$

4. Discuss kinds and functions of teeth. Using the key, give guidance in drawing teeth and leaving spaces where they are missing.

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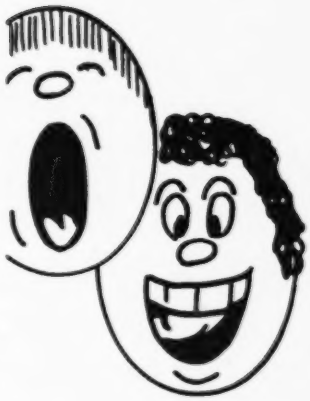
IX. **What the Students Will Do**

1. Students will predict their own total number of teeth.
2. Partners will count upper and lower teeth; results will be confirmed by trading partners. Mirrors may be used.
3. Students will glue a paper square above their individual total on a class graph.
4. Students will gather and record data from the rest of their group.
5. Students will find totals and averages for upper, lower, and total teeth.
6. Students will use mirrors to make a pictorial record of their teeth.



X. **Discussion**

1. What do you think the class average will be? (Be sure to add up individual totals, not averages.)
2. Would another grade have different results? Adults? (See Extensions.)

XI. **Extensions**

1. Discuss nutrition, chewing food well, and tooth care.
2. Ask one or more students to gather data from another grade and compare results using the left portion of the worksheet.
3. Count fillings and find the average.
4. Ask the school nurse to bring in a model of teeth.
5. Talk to a vet or zookeeper about animals' teeth.

XII. **Curriculum Coordinates**

Language Arts

1. Write a story or diary from the tooth's point of view.
2. Study prefixes such as "bi" and "in".

Social Science

1. Find out about the teeth of early Indians (diet, cleaning).
2. Find out about George Washington's teeth (thought to be wooden but actually ivory).
3. How do modern people take care of their teeth? (brushing, flossing, checkups, fillings, etc.)

Art

1. Draw and label the different layers of a tooth.

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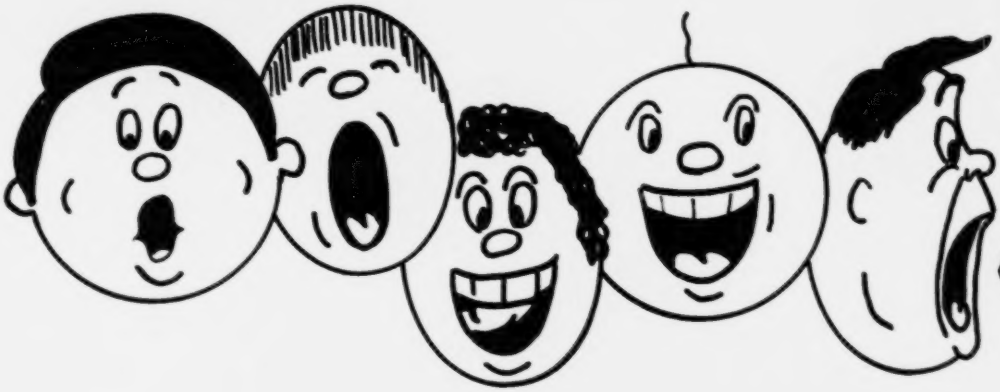


SAY AH!

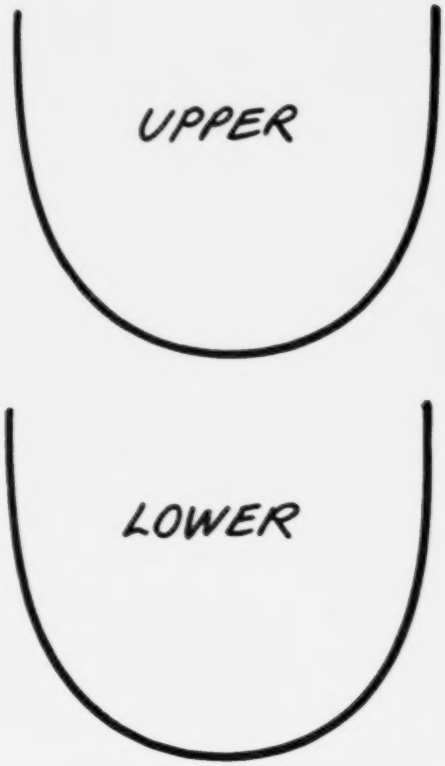
YOUR TOTAL TEETH

ESTIMATE: _____

ACTUAL: _____

WHAT IS YOUR GROUP'S AVERAGE NUMBER OF TEETH?

NAMES	UPPER TEETH	LOWER TEETH	TOTAL TEETH
TOTALS			
AVERAGES			



DRAW YOUR TEETH.

KEY

INCISORS ▭
CUSPIDS △
BICUSPIDS ○
MOLARS □

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I. **Topic Area**

Human Body—Heart

II. **Introductory Statement**

Students will learn that the heart rate increases as exercise becomes more strenuous.

III. **Math Skills**

a. Counting
b. Multiplication
c. Graphing

Science Processes

a. Predicting
b. Gathering and recording data
c. Generalizing

IV. **Materials**

Clock/watch with second hand
Overhead transparency of graph (suggested)

V. **Key Question**

How is your heartbeat related to exercise? (Your pulse goes up the more strenuously you exercise.)

VI. **Background Information**

The heart is about the size of your fist. It has four rooms through which blood passes. After going through the right atrium and ventricle, the blood goes to the lungs to pick up oxygen. Then it is pumped through the left atrium and ventricle and out to the body through the aorta. (See encyclopedia for futher information.)

Aerobic exercise is designed to keep the heart pumping at 130 to 150 beats per minute (depending on age, etc.) for a sustained period of time, usually 20 or more minutes. This strengthens the heart and keeps blood vessels in good working condition. After awhile, the resting heart rate should become lower, a desirable goal.

Children's heartbeats are generally faster than adults.

VII. **Management**

1. This activity will take about 45 to 60 minutes.
2. Each person will take their own pulse on the inside of the wrist or on the neck (do not use the thumb to take a pulse because it can have one of its own).

VIII. **Procedure**

1. Using the clock, discuss ways a minute can be divided to measure heartrate. Decide the time length to be used.

Seconds	Mult. By
20	3
15	4
10	6
6	10

2. Allow one to two minutes of brisk walking and the same for running before measuring pulse.
3. As the students are getting ready to count their pulses after walking or running, have them feel for their pulse *before* they actually stop so they will be ready to start counting immediately when the signal is given.
4. Use the following hints to obtain accurate results:
   a. Have the students silently mouth their counting instead of just thinking it; counting out loud is confusing.
   b. Take more than one reading of each activity as some will not have counted correctly. Screen their answers by having each one quickly say their count. Use this chart as a general guide:

	15 Seconds	60 Seconds
Resting	12-25	50-100
Walking	22-38	90-150
Running	40-55	160-220

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IX. What the Students Will Do

1. Students will write the number of seconds to be used and the number to be multiplied.
2. Students will predict their resting heartrate.
3. Students will count, then multiply to find their resting heartrate per minute.
4. Students will walk briskly for one to two minutes, count, and compute their walking pulse.
5. Students will run (not jog) for one to two minutes, count, and compute their running pulse.
6. Students will fill in the graph with the teacher's guidance.
7. Students will make generalizations from the graph.

X. Discussion

1. What would happen if you tried to count one full minute? (heartbeat would slow and change results, might lose count)
2. Why is exercise good for your heart? (Your heart is a muscle and needs to stay in good condition.)
3. What kinds of exercise would strengthen your heart? (fast walking, running, swimming, skipping rope, cycling, dancing, soccer, basketball, etc.)

XI. Extensions

1. Find the class range for each activity (lowest-highest).
2. Find the average heartrate for each activity.
3. Use the same three exercises and count breaths per minute.
4. Combine this activity with a study of the circulatory system. Your school nurse may be able to obtain a pig or cow's heart from the butcher.

XII. Curriculum Coordinates

Physical Education

Experiment with aerobic exercise and see if it lowers your heartbeat over a period of time.

Language Arts

Find words and sayings that use "heart" and learn their meanings.

heartache	heart to heart
heartbroken	to one's heart's content
heartburn	get to the heart of
heartfelt	eat one's heart out
heartstring	wear one's heart on one's sleeve
heartless	heavy heart
heart-throb	heart-warming

Art

Tie in with Valentine's Day. To show heart size, students may use white paper to trace around their fists. Cut and glue onto a red heart.

Computer

Draw a valentine heart using LOGO or another graphics language.

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NAME _____

I'VE GOT RHYTHM

HOW IS YOUR HEARTBEAT RELATED TO EXERCISE?

1. COUNT YOUR HEARTBEATS FOR ____ SECONDS.
2. MULTIPLY BY ____ TO FIND HEARTBEATS PER MINUTE

RESTING	WALKING	RUNNING
_____	_____	_____
X _____	X _____	X _____
_____	_____	_____
_____	_____	_____

PREDICT

YOUR RESTING HEARTRATE _____

NUMBER OF HEARTBEATS PER MINUTE

	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240
RESTING																								
WALKING																								
RUNNING																								

WHAT DID YOU FIND OUT? _____

_____

_____

_____

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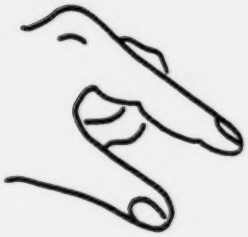
THUMB FUN



I. **Topic Area**

The Human Body (Hand)

II. **Introductory Statement**

Students will learn about the unique qualities of the human hand and how its design affects the way they live.

III. **Math Skills**

a. Whole number computation
b. Graphing
c. Averaging
d. Rounding

Science Processes

a. Measuring (Time)
b. Gathering and recording data
c. Interpreting data
d. Controlling variables

IV. **Materials**

zippered pants	crackers	shirt with buttons
table knife	combs	peanut butter
milk	sugar	sandwich bags
pencil activity	cereal	nerf football
scissor activity	bowls	spoons
stop watch	phone	

These materials are for the activities suggested in Section VII. Management. You may plan your own activities with supplies which are readily available to you.

V. **Key Question**

How important are your thumbs? (Refer to Section VI. Background Information).

VI. **Background Information**

Hands are designed for taking hold of objects. Human hands have "opposable thumbs"—thumbs that can be moved against the fingers. Our thumbs make it possible for us to grip things and make delicate movements. Human progress would have been greatly changed by the absence of opposable thumbs.

The parts of the human hand are: the wrist, the palm, the four fingers, and the thumb. There are twenty-seven bones in the hand; eight in the wrist, five in the palm, three in each finger and two in the thumb.

The hand is moved by thirty-five muscles. Fifteen muscles are in the forearm giving the hand great strength. Near the wrist the muscles become tendons which run along the palm and the back of the hand to the fingers.

VII. **Management**

Thumb Fun takes about one week and can be run concurrent with regular classroom activities. The suggested activities take from 8 to 20 minutes per student, per race.

Set up stations with activities which simulate daily tasks. Activities should involve as much gripping as possible. Suggested activities with a brief description are listed below.

GETTING UP: Start race in a reclining position, shoes off.

DRESSING: Use a slightly baggy shirt and pants which students can slip over their regular school clothes.

FIX AND EAT BREAKFAST: Provide cereal, spoons, bowls, milk and sugar. Students are to fix and eat a mini-breakfast.

MAKE LUNCH: Provide crackers and peanut butter for students to make a sandwich with. Have them place the sandwich in a baggy and take it with them.

GO TO SCHOOL: Students go to another part of the room carrying their lunch and a stack of books.

SCHOOL WORK (pencil): Use an activity which is difficult but does not have so much writing as to become frustrating. Math facts drill works well here.

RECESS: Activities which involve gripping a ball are good to use here. A nerf football and a wastebasket to throw it in is suggested.

PHONE HOME: Use a disconnected phone for the students to dial home on.

SCHOOL WORK (scissors): Make a simple pattern for the students to cut out.

EAT LUNCH: Students are to eat the sandwich they prepared earlier.

GO HOME: If available have the students (while carrying their stack of books) open and close a door which has a door knob.

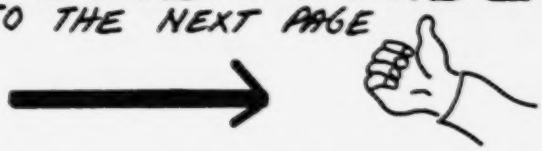
UNDRESS: Students remove shoes and clothing.

GO TO BED: Students return to reclining position and "race" is over.

Students will do these activities twice, first with the use of their thumbs and then without the use of their thumbs. Each student will have two race times. Stop watches should start with "GETTING UP" and stop with "GOING TO BED."

Races should be run exactly alike both times. The only variable to change is the use of thumbs. You should be very specific in deciding how each activity will be performed.

THUMB A RIDE
TO THE NEXT PAGE



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Students will work in groups of three taking turns as runners, timers and recorder/guides.

If a student is not able to complete an activity, he/she is to keep trying for 30 seconds and then has a 60 second penalty added to their time.

Most students will be able to perform all the tasks thumbless but are much less efficient. This loss of efficiency is reflected in their final time.

THUMB

VIII. **Procedure**

1. Set up the race.
2. Ask the key question, explain and supervise the race.
3. Aid students in rounding their race times to the nearest minute, finding the difference between race times, finding group averages and completing the group graph.
4. Conduct discussion using the discussion questions in Section X.
5. Do the class graph.

IX. **What the Students Will Do**

Please refer to Section VII and VIII.

X. **Discussion**

1. Which race was the most difficult?
2. What kinds of activities were hard to do without the use of your thumbs? Why were these activities difficult? (Activities which involve gripping will be the most difficult).

XI. **Extension**

1. Assign students to do reading about monkeys/chimpanzees focusing on thumbs.

   Human beings are different from other animals in that they have opposable thumbs on both hands. However, larger New World monkeys while not possessing opposable thumbs, do have opposable big toes. Old World monkeys have both opposable thumbs and big toes.
2. Have students do reading about the "hands" of other animals and how they are adapted to different types of activities.

   In many animals, part of the forelimb corresponds to the human hand. No animal hand has more than five digits. Animal hands are adapted to different types of activity which govern, in part, the type of life they lead. An example of this would be the evolution of the horse. The horse actually stands on its middle finger. Through many years the middle finger has become stronger and longer while the other fingers have become smaller or have disappeared.

XII. **Curriculum Coordinates**

Language

1. Make a list of thumb and hand compound words.
2. Discuss slang terms using the words thumb and hand.

to be all thumbs	from hand to mouth
thumbs down	give a hand
thumbs up	hand in
twiddle one's thumbs	hand down

3. Write "Thumb Twisters." Example: Thadeus Thornthort, Thane of Thebes, thumbed the thesaurus thankfully.
4. Have the students write a story about how the world would be different if everyone were thumbless.

Social Science

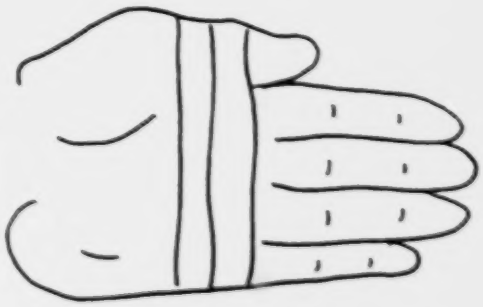
1. The human hand helps people to communicate with each other as in the sign language of the North American Indian. Study Indian sign language.
2. Read the biography of Louis Braille, inventor of the Braille alphabet.
3. Read a story about Tom Thumb and Phineas T. Barnum. Tom Thumb is listed in the encyclopedia under his real name, Charles Sherwood Stratton.

Physical Education

1. Students can try playing some of their favorite games thumbless.
2. Students can invent a new thumbless game.

Art

1. Have students sculpt or draw their hand.
2. Art appreciation can be taught with emphasis upon the hand as it appears in art work. When not used as a centerpiece itself, it is used in gesture to complete a line, to highlight an area, to focus attention, to set a mood. "The Creation of Adam" by Michelangelo, recently copied by Steven Spielberg in E.T. (Did E.T. have opposable thumbs?) is an excellent example of the use of the hand in art. Refer to the encyclopedia for examples of sculpture and painting.



FUN

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THUMB FUN

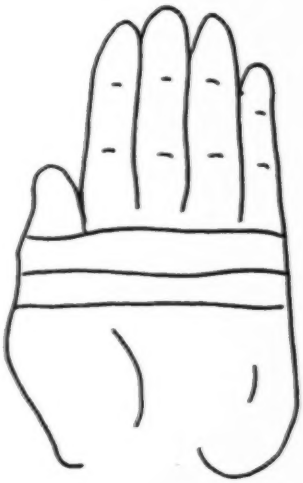
HOW IMPORTANT ARE YOUR THUMBS?

1. THINK ABOUT THE THINGS YOU DO EACH DAY USING YOUR HANDS.
2. MAKE A LIST OF THOSE ACTIVITIES WHICH YOU COULD ACT OUT IN THE CLASSROOM. COLLECT THE THINGS YOU WILL NEED.
3. USE A STOPWATCH TO TIME HOW LONG IT TAKES YOU TO DO THE THINGS ON YOUR LIST FROM START TO FINISH. ROUND YOUR TIME OFF TO THE NEAREST MINUTE AND RECORD IT IN THE "THUMBS" SQUARE BELOW.
4. NOW HAVE SOMEONE TAPE YOUR THUMBS ACROSS OR NEXT TO THE PALMS OF YOUR HANDS. LEAVE YOUR OTHER FINGERS FREE. TIME YOURSELF REPEATING THE LISTED ACTIVITIES. ROUND YOUR TIME TO THE NEAREST MINUTE. ADD A ONE MINUTE PENALTY FOR ANY ACTIVITY YOU WERE UNABLE TO COMPLETE. RECORD YOUR TIME IN THE "NO THUMBS" SQUARE.

ACTIVITIES

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

[ ]	NO THUMBS
− [ ]	THUMBS
[ ]	DIFFERENCE



THUMB A RIDE

TO THE NEXT PAGE →

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THUMB FUN A GRIPPING EXPERIENCE

5. THE DIFFERENCE BETWEEN YOUR "THUMBS" TIME AND YOUR "NO THUMBS TIME SHOWS YOUR LOSS OF EFFICIENCY. ARE YOU MORE EFFICIENT WITH THUMBS OR WITHOUT?

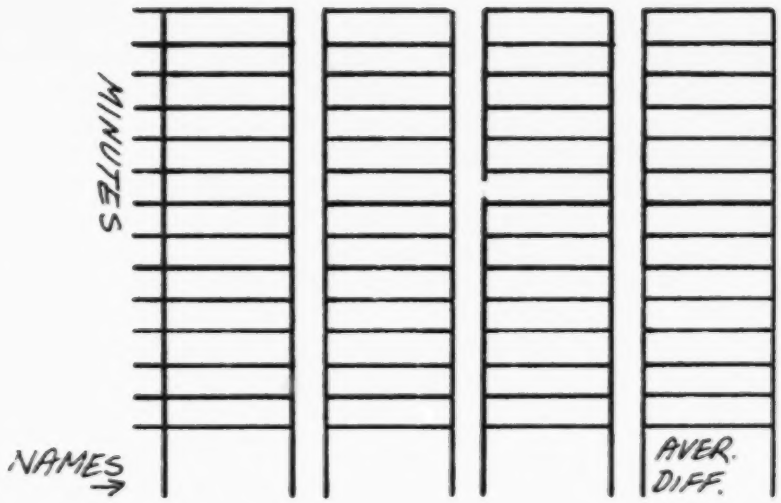
_____

6. USE YOUR DIFFERENCE FIGURES AND THE TABLE BELOW TO FIND THE AVERAGE LOSS OF EFFICIENCY FOR YOUR GROUP.

NAMES	DIFFERENCE
TOTAL	

÷ 3 = [ ]

BAR GRAPH



THAT WAS THUMB FUN!

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THUMB MORE

MINUTES

NAMES →

GIMME FIVE!

I. **Topic Area**
Patterns in Nature

II. **Introductory Statement**
Students will look for patterns in fingerprints.

III. **Math Skills**
a. Geometry
b. Graphing

Science Processes
a. Observing and classifying
b. Gathering and recording data
c. Interpreting data

IV. **Materials**
Scotch tape (7 pieces approx. 1½" in length per student)
One piece of 3" square paper for each student (for pencil rubbing)
One piece of 2" square paper for each student. Yellow works best. (for class graph)
Poster size picture of a Loop, Arch and Circle fingerprint. Make by using an overhead projector.
1. Make a transparency for figures 1, 2 and 3 from the Background Information.
2. Project transparencies on to poster size paper and copy.

V. **Key Question**
How would Encyclopedia Brown, boy detective, solve a crime?

VI. **Background Information**
There are three basic types of fingerprints: Loop, Arch and Circle. All fingerprints are composed of one or more of these types. Their characteristics are:

Loop: Lines entering at one side of the finger pad and leaving on the same side. Figure 1

Fig. 1 - Loop

Arch: Lines entering on one side of the finger pad and leaving on the opposite side. Figure 2

Fig. 2 - Arch

Circle: Lines entering at the side of the finger pad and spiraling inward ending in the center. Figure 3

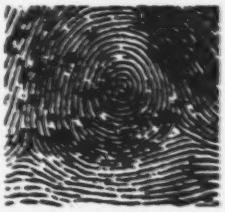

Fig. 3 - Circle

VII. **Management**
1. This activity will take approximately 40 minutes.
2. Make sure students use the pad of their finger (area just above the last joint) for their fingerprint, not the tip.
3. Have tape ready ahead of time or have a student pass it out while you describe the fingerprint designs.
4. Have water available for cleaning fingers.

VIII. **Procedure**
1. Purchase tape.
2. Make a chart for verticle pictograph.
3. Students will put their left index fingerprint on the graph.
4. Explain the types of fingerprints using the charts as visual aids.

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IX. **What the Students Will Do**

1. Using the 3" square piece of paper, shade an area with a pencil.
2. Rub left index finger on the pencil mark until your finger pad is covered with pencil lead.
3. Apply tape to finger. Peel the tape off.
4. Put the tape on the 2" piece of paper.
5. Examine the design and compare it to the poster examples.
6. Mark below it what type of print it is. L for Loop, A for Arch and C for Circle.
7. Place paper in correct column on the classroom graph.
8. Discuss results (see discussion questions).
9. Repeat steps 1 through 3 for each finger on the left hand.
10. Place tape on correct finger of the student worksheet.
11. Make an extra copy of one of the fingerprints and place it in the "Who Dunnit?" box.
12. Trade papers and guess which finger the "Who Dunnit?" print came from.

X. **Discussion**

1. Which fingerprint, for our class, is the most common?
2. Are all fingerprints on one hand the same? (No)
3. On what other parts of the body might you find prints? (Accept any reasonable answer)

XI. **Extensions**

1. Discuss and classify other types of fingerprints.
2. Examine animals and plants for distinct print patterns.
3. Have a police investigator come in and discuss fingerprint classification.
4. Measure the area of your hand using graph paper.
5. Using the tape method, make a model of the prints on your hand and arm. Trace your arm on white paper and place your tape pattern on your arm model in the correct place.

XII. **Curriculum Coordinates**

Health

Research skin structure. Epidermis, Dermis, pores, etc.

Physical Education

Invent new types of "Give Me Five" hand slaps.

Language Arts

Research the measuring of horses by "hands."

Art

Make animals from your hand tracing. The Thanksgiving turkey is the most common.

Make reindeer and use hand tracings for the antlers and a triangle for the head.

Make a "Who Dunnit?" bulletin board and place a fingerprint from a teacher there for the students to figure out.

Trace your hand then decorate the drawing. Write sentence strips "These hands like to..."

For Christmas, trace hands on green paper, curl the fingers and put tracings together to form a tree.

WHO DUNNIT

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NAME

GIMME FIVE!

WHO DUNNIT

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NEAT FEET

I. **Topic Area**
The Human Body (Feet)

II. **Introductory Statement**
Students will calculate how much weight their feet support per square inch. Students will compute the weight per square inch for various animals' feet and graph the results for comparison.

III. **Math Skills**
a. Calculator usage
b. Formulas
c. Graphing
d. Measuring (area and weight)
e. Whole number computation
f. Reading decimals
g. Rounding decimals

Science Processes
a. Gathering and recording data

IV. **Materials**
Square inch graph paper
Calculators
Scale

V. **Key Question**
How much weight do your feet support?

VI. **Background Information**
Your feet support all of your body weight. To be able to compare the weight your feet support with the weight supported by various animals it is necessary to use a standard unit of measure.
There are 26 bones in the human foot. There are 7 ankle bones, 5 instep bones and 14 toe bones.

VII. **Management**
This activity will take from 30 to 45 minutes for a class of 24 sharing 12 calculators and working in pairs.
Students can be figuring the area of their feet while waiting to weigh.

VIII. **Procedures**
1. Pose the key question to the class.
2. Explain to the students about the proper method of weighing themselves.
3. Demonstrate how to trace the outline of feet on graph paper.
4. Show how to count the number of squares that fall inside the outline of their feet. Squares that are more than half inside the outline count as one. Squares that are less than half inside the outline do not count.
5. Show students where to enter their weight and area.
6. Demonstrate the use of the calculator. When working with their own weight, students will most likely end up with a decimal which you will have to round off.

IX. **What the Students Will Do**
1. The students will weigh themselves.
2. They will trace the outline of their feet and figure the area of their feet from that outline.
3. They will compute the amount of weight supported by each square inch of their feet.
4. Students will complete the comparison table on page 2 of the worksheets.

X. **Discussion**
1. Whose feet carry the heaviest load?
2. How do your feet compare with some animals' four feet?
3. Is there an animal on the table which has a body weight close to your own?
4. How does that animal's feet compare to your feet? Whose feet work the hardest?

XI. **Extensions**
Students can complete the graph and inch prints on page 3.

XII. **Curriculum Coordinates**
Language
1. Have students write a paragraph about their feet.
2. A "foot" in poetry is a rhythmic unit of two or three syllables.
3. Create an imaginary footprint (art) and write a story about the animal belonging to that footprint.

Art
1. Make castings of footprints.
2. Have students paint pictures using their toes as brushes.

Social Science
1. Have students study the feet of famous people, past and present.
2. Plan a treasure hunt with footprints leading to the treasure.
3. Have students bring in their baby prints and weights and figure their pounds per square inch.
4. Have students bring in different styles of shoes and figure pounds per square inch. Discuss how fashion affects our lives.

Science
1. Collect animal footprints and weights. Check the local zoo or contact a circus.
2. Study the feet of different animals. Do animals rest their feet as human beings do?

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NAME _____

NEAT FEET

YOUR FEET SUPPORT YOUR BODY WEIGHT

[ ]	÷	[ ]	=	[ ]
WEIGHT		AREA		LBS. PER SQ. IN.

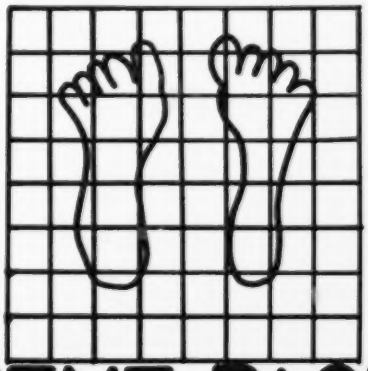
1. WEIGH YOURSELF AND PUT YOUR WEIGHT IN THE WEIGHT SQUARE OF THE EQUATION ABOVE.

2. TO FIND THE AREA OF THE BOTTOM OF YOUR FEET, DO THE FOLLOWING:

TAKE YOUR SHOES AND SOCKS OFF.

STAND ON A PIECE OF ONE INCH GRAPH PAPER AND TRACE THE OUTLINE OF YOUR FEET.

COUNT THE NUMBER OF SQUARES THAT FALL INSIDE THE OUTLINE AND PUT THAT NUMBER IN THE AREA SQUARE ABOVE.



STEP TO THE NEXT PAGE

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CALCULATOR

STEPS

1. TURN THE CALCULATOR "ON."
2. PUSH "C" TO CLEAR. CHECK THAT IT READS "0."
3. ENTER YOUR WEIGHT.
4. PUSH ÷.
5. ENTER THE AREA
6. PUSH =
7. WRITE THE ANSWER ON THIS LINE. _____
8. ROUND OFF YOUR ANSWER AND WRITE IT IN THE LBS. PER SQUARE INCH BOX ON PG. 1. THIS COMPLETES YOUR EQUATION.

MORE STEPS

USE YOUR CALCULATOR TO COMPLETE THE TABLE.

WEIGHT ÷ AREA = LBS. PER SQUARE INCH

ANIMAL	WEIGHT	AREA	LBS PER SQ.IN.
MY FEET			
DOG	82	25	
ELEPHANT	9430	410	
DEER	300	12	
LION	200	20	

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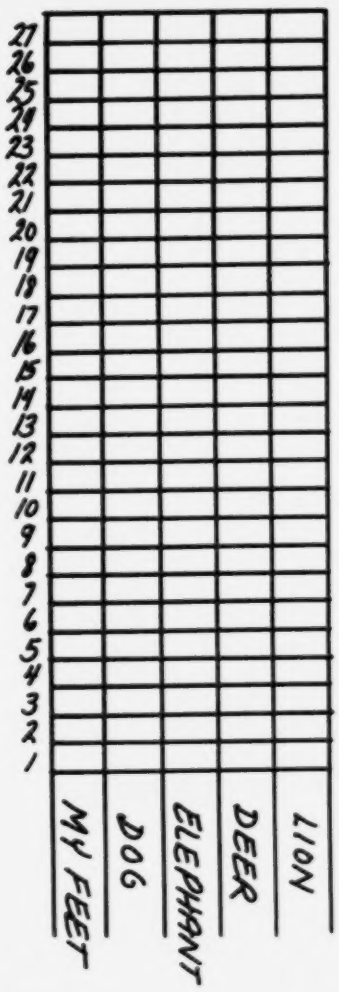
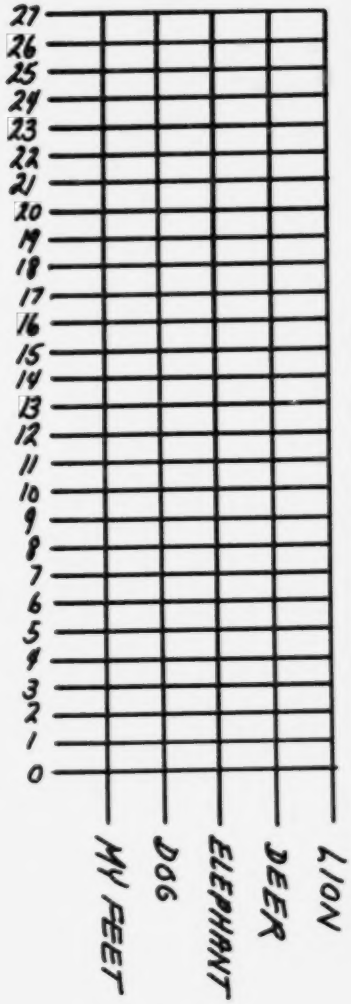
GRAPHS





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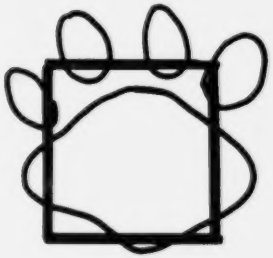
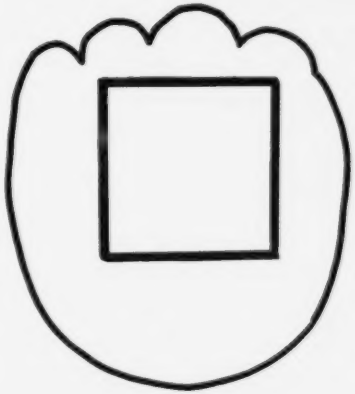
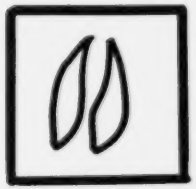
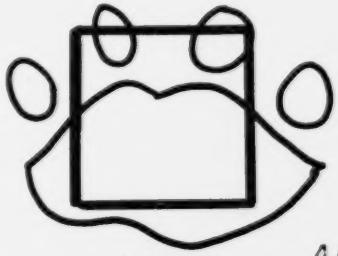
INCH PRINTS









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COMPRESSION SESSION

I. **Topic Area**

The Human Body (Spine)

II. **Introductory Statement**

The students will measure their height in the morning and then again in the afternoon to determine the amount their body "compresses" or shrinks in one day.

III. **Math Skills**

a. Measuring height
b. Whole number computation
c. Averaging
d. Graphing

Science Processes

a. Measuring
b. Gathering and recording data

IV. **Materials**

Measuring Tape

V. **Key Question**

Do you stay the same height all day long?

VI. **Background Information**

The spine is composed of separate bones called vertebrae. Sandwiched between the vertebrae are soft cartilage discs which act as cushions. Standing squeezes out liquid in the discs which accumulates at night compressing the spine as the day wears on. The effect of this is that you are shorter in the evening than in the morning. Of course, you recover your height each night while sleeping—a fact which should be stressed when presenting this lesson to the students.

VII. **Management**

1. Compression Session takes one week to complete.
2. Students will need some instruction in how to accurately measure height.
3. The teacher should do the measuring the first day to obtain an accurate guide.
4. Students should work in pairs. This should take about 10 minutes per pair per day.

VIII. **Procedures**

1. Pose the key question.
2. Explain how to measure height accurately. Stress the importance of being precise.
3. On the first day measure each student in the morning and the afternoon.
4. Explain to the students how to record their findings on student worksheet 1. Have students complete the subtraction indicated by each day's findings.
5. Have students complete questions 2 and 3 and discuss at the end of the five day recording period.
6. Have students find their average shrinkage for the 5 day period using the averaging section on student worksheet 2.
7. Have students break into groups of 5. Using the data collected from the averaging have them graph their average shrinkage on the bar graph provided.

IX. **What the Students Will Do**

1. Students will measure their height in the morning and then again in the afternoon for one week and record the data on the table provided on page 1. Students can complete their subtraction each day.
2. After gathering the data for one week students will respond to questions 2 and 3.
3. Students will use the "amount of shrinkage" figures on page 1 to figure their average shrinkage for the week using the steps provided on page 2.
4. Students will graph their average figure and compare results on the graph provided.

X. **Discussion**

1. How many of you stayed the same height all day long?
2. Who shrunk the most?
3. Did you shrink the same amount each day?
4. What do you think makes you get smaller?

XI. **Extension**

1. Students can repeat the data gathering period to test the effects of various activities upon their shrinkage.
   - Running versus non-running days
   - Active versus non-active days
   - Hanging on the bars versus not hanging on the bars
2. Students can repeat the data gathering period to test the effects of fluid intake upon shrinkage.

XII. **Curriculum Coordinates**

Language Arts

Students can do reading about the spinal column.

Health

Students can study about injuries to the spinal column and the handicaps such injuries can cause. A study of safety rules would be appropriate at this time.

Art

Students could build a model of the spinal column.

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NAME _____

COMPRESSION SESSION

DO YOU STAY THE SAME HEIGHT ALL DAY LONG?

1. CAREFULLY MEASURE YOUR HEIGHT IN THE MORNING AND THEN AGAIN IN THE AFTERNOON OR EVENING. RECORD THE RESULTS BELOW.

	MON.	TUES.	WED.	THURS.	FRI.
A.M.					
P.M.					
AMOUNT OF SHRINKAGE					

2. DID YOU GET SHORTER OR TALLER? _____

3. WHY DID THIS HAPPEN? _____

_____

_____

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FIND YOUR AVERAGE

USE YOUR FIVE SHRINKAGE FIGURES FROM PAGE 1 TO FIND YOUR AVERAGE AMOUNT OF SHRINKAGE FOR THE WEEK.

MON. ☐

TUES. ☐

WED. ☐

THURS. ☐

FRI. + ☐

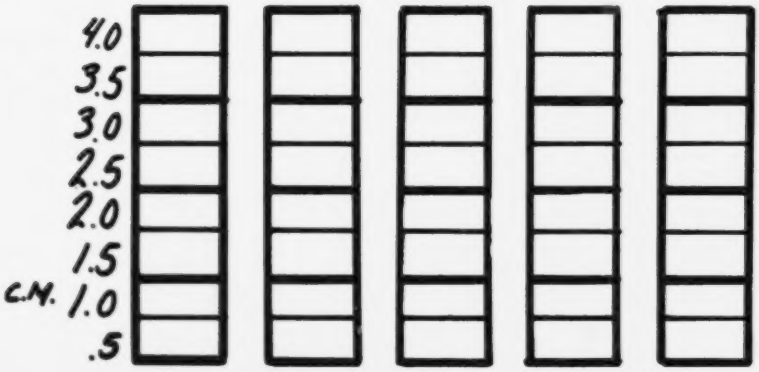
☐

USE THIS SUM TO DIVIDE!

5

USE THIS FOR GRAPHING!

SEE HOW YOU COMPARE



COMPARE YOUR SHRINKAGE WITH 4 OTHER FRIENDS USING THE BAR GRAPH.

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BY GOLLY BY GUM

I. **Topic Area**
Nutrition

II. **Introductory Statement**
Students will discover how much sugar is in bubble gum.

III. **Math Skills**
a. Whole number computation: subtraction
b. Measurement in metric units
c. Graphs

Science Processes
a. Measuring
b. Gathering and recording data
c. Interpreting data

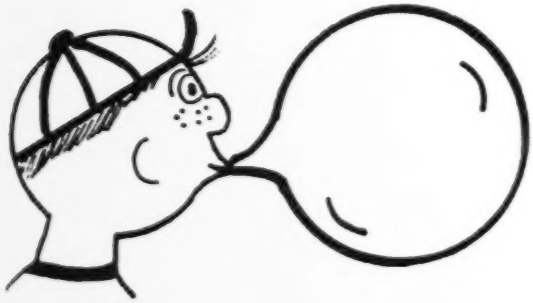
IV. **Materials**
6 different brands of bubble gum (NOT sugarless)
6 small cups
scales and weights
colored felt pens, pencils, or crayons
student worksheet

V. **Key Question**
How much sugar is in bubble gum?

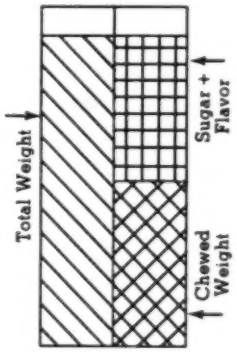
VI. **Background Information**
none

VII. **Management**
This activity may take 30 minutes.

VIII. **Procedure**
1. Teacher will divide the class into six groups.
2. Teacher will give one pack of gum to each group.
3. Each group will weigh their pack of gum *without wrappers* in a small cup.
4. Teacher will instruct each group to chew their pack of gum for *10 minutes*.
5. Each group will weigh their pack of gum again in the same small cup.
6. Teacher will instruct students to record all data on the worksheet and to compute the amount of sugar (plus flavor) per pack.



7. Teacher will demonstrate how to complete the graph.
   a. Draw a solid line across both bars of each set to indicate total weight of pack.
   b. Color in the "total weight" bar.
   c. Using different colors, divide the second bar to show "chewed weight" and "sugar + flavor."



IX. **What the Students Will Do**
1. Students will weigh packs of bubble gum, dry and chewed.
2. Students will record all data and complete student worksheet.

X. **Discussion**
1. Is sugar good for you?
2. Are there different kinds of sugar? (fructose, sucrose, dextrose, lactose). Are any of these sugars good for you?
3. Where does sugar come from? (sugar cane or sugar beets give us all the boxed or bagged sugar found in stores).

XI. **Extensions**
1. Compare sugar and sugarfree bubble gum.
2. Use regular gums, such as Juicy Fruit, Double Mint, etc.

XII. **Curriculum Coordinates**

Music
Learn "Does Your Chewing Gum Lose Its Flavor On the Bedpost Overnight?" Learn "The Ballad of Lucy Lumm."

Language Arts
Write a story about "The Biggest Bubble Ever Blown."

Social Studies
Find out how sugar is made.
Find out where "natural" sugars (fructose, sucrose, dextrose, lactose) are found.
Visit a sugar mill.

Art
Do a picture of a fantasy work inside a blown bubble of bubble gum.

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BY GOLLY BY GUM

Consumer Tester

How Much Sugar is in GUM?

	BRAND NAME	FLAVOR	Total Weight of pack	Chewed Weight of pack	Difference (Total − chewed)	Ratio Difference / Total	% Sugar Ratio X 100 = %
1							
2							
3							
4							
5							
6							

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BY GOLLY – BY GUM!

Name _____

MASS IN _____

46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0

Total	Chewed	Total	Chewed	Total	Chewed	Total	Chewed	Total	Chewed	Total	Chewed	Total	Chewed

Brand	①	②	③	④	⑤	⑥	⑦

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Author _____

_____

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CANDY FACTORY FACTS NUMBER

I. **Topic Area**
Food

II. **Introductory Statement**
Students will explore samples of bags of M & M's to determine packaging patterns with regard to number.

III. **Math Skills**
a. Place value
b. Whole number computation
c. Predicting
d. Counting
e. Graphing

Science Processes
a. Gathering and recording data
b. Interpreting data

IV. **Materials**
Small bags of M & M's

V. **Key Question**
Are all bags of M & M's alike in number and color?

VI. **Background Information**
Bags of M & M's all contain five colors with dark brown the most common color. Though variations do occur, they are slight enough to allow generalizations with regard to total number in bag and frequency and infrequency of different color groups.

VII. **Management**
1. Each student should be given a bag of M & M's and a set of student worksheets.
2. This activity takes 60 minutes and should be taught after a lesson on place value to avoid confusion on the use of the tables provided.
3. Students should make their predictions and do the computation before opening their bags.
4. When recording their "actual" data, students should divide into color groups, counting each color and recording their findings. Students should then add to find the total number in the bag, then count the total number to check their answer.
5. Students can be introduced to the bar graph when they graph the information from the two tables. This is a good time to discuss the differences between their predictions and their actual findings.
6. Students should break into groups of five to share information and complete the group graph. Discuss findings and complete the conclusions section of the student's worksheet.

VIII. **Procedure**
1. Pass out bags of M & M's and have students predict what is in them by completing Table 1.
2. Have students open bags, count and record data to complete Table 2.
3. Have students complete page 2 of student worksheets with teacher guidance.
4. Students break into groups of 5 to share data to complete group graph.
5. Conduct class discussion and complete "conclusions" section of worksheets.

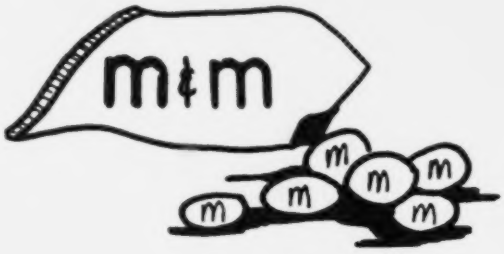
IX. **What the Students Will Do**
Refer to sections VII and VIII.

X. **Discussion**
See questions on student worksheets.

XI. **Extensions**
1. Students can test the larger bags of M & M's to see if similar patterns emerge.
2. Students can test "generic brand M & M's" and compare with M & M's.
3. Students can write their own investigation based upon another type of candy or food product.
4. Refer to Project Aims Investigation "What's in the Bag."

XII. **Curriculum Coordinates**
Language
1. Write to the M & M/Mars Company, Division of Mars, Inc., Hackettstown, New Jersey 07840.
2. Write a comic strip showing how M & M's are made.

Social Science
1. Find out the history of M & M's.
2. Study how the factory system got started. Have students create their own assembly line.



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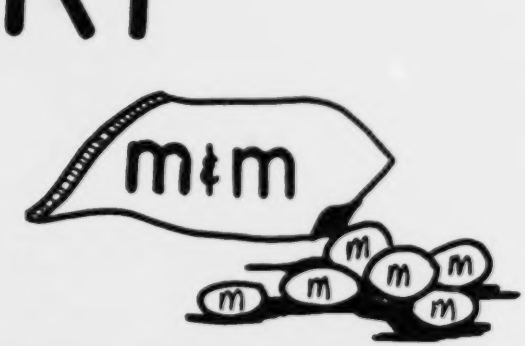
NAME _____

CANDY FACTORY FACTS

NUMBER



PREDICTION

	HUNDREDS	TENS	ONES
GREEN			
ORANGE			
YELLOW			
LIGHT BROWN			
DARK BROWN			
TOTAL			

56

ACTUAL

	HUNDREDS	TENS	ONES
GREEN			
ORANGE			
YELLOW			
LIGHT BROWN			
DARK BROWN			
TOTAL			

57

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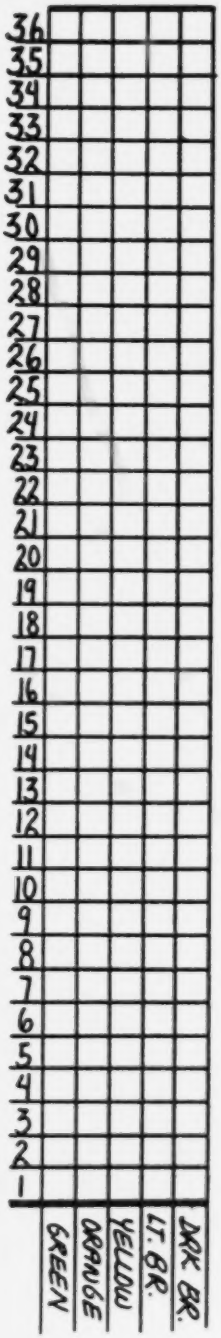
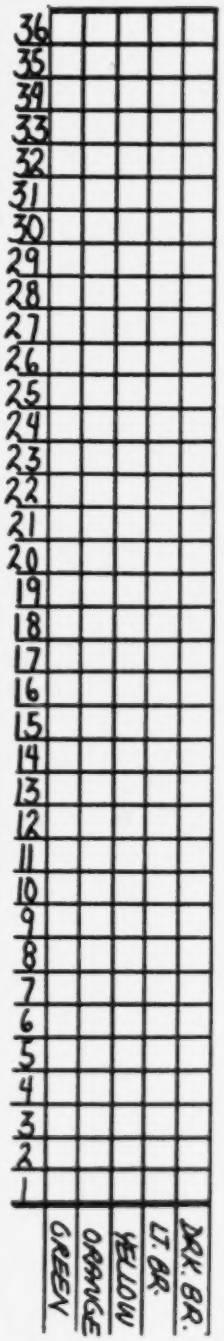
PREDICTION



ACTUAL



NUMBER

1. HOW MANY M&M'S DID YOUR PACKAGE HAVE?

_____

2. WHAT WAS THE MOST COMMON COLOR?

_____

3. WHAT WAS THE LEAST COMMON COLOR?

_____

4. USE YOUR TABLES FROM PAGE 1 TO COMPLETE THE GRAPHS.

5. ARE ALL BAGS OF M&M'S THE SAME? FIND OUT! COMPARE GRAPHS WITH 4 OTHER STUDENTS!

CONCLUSIONS

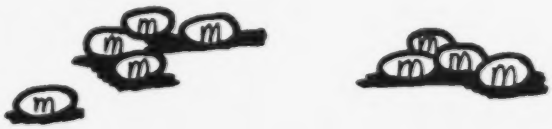
1. M&M'S HAVE BETWEEN _____ AND _____ CANDIES IN A BAG.

2. THE LEAST COMMON COLOR IS

_____

3. THE MOST COMMON COLOR IS

_____



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CANDY FACTORY FACTS WEIGHT

I. **Topic Area**
Food

II. **Introductory Statement**
Students will explore samples of bags of M & M's to determine packaging patterns with regard to weight.

III. **Math Skills**
a. Place value
b. Whole number computation
c. Predicting
d. Measuring (weight)
e. Graphing

Science Processes
a. Gathering and recording data
b. Interpreting data

IV. **Materials**
Small bags of M & M's
Scales

V. **Key Question**
Are all bags of M & M's alike in weight and color?

VI. **Background Information**
Bags of M & M's all contain five colors with dark brown the most common color. Though variations do occur, they are slight enough to allow generalizations with regard to weight and frequency and infrequency of color groups.

VII. **Management**
1. Each student should be given a bag of M & M's and a set of student worksheets.
2. This activity varies in length depending upon the number of scales available.
3. This should be taught after a lesson on place value to avoid confusion on the use of the tables provided.
4. Students should make their predictions and do the computation before opening their bags.
5. When recording their "actual" data, students should divide into color groups, weighing each color and recording the data on Table 2. Students should then add to find their total weight, then weigh all M & M's to check their addition.
6. Students can be introduced to the bar graph when they graph the information from the two tables. This is a good time to discuss the differences between their predictions and their actual findings.
7. Students should break into groups of five to share information and complete the group graph. Discuss findings and complete the conclusions section of the student's worksheet.

VIII. **Procedure**
1. Pass out bags of M & M's and have students predict what is in them by completing Table 1.
2. Have students open bags, weigh and record data to complete Table 2.
3. Have students complete page 2 of student worksheets with teacher guidance.
4. Students break into groups of 5 to share data to complete group graph.
5. Conduct class discussion.

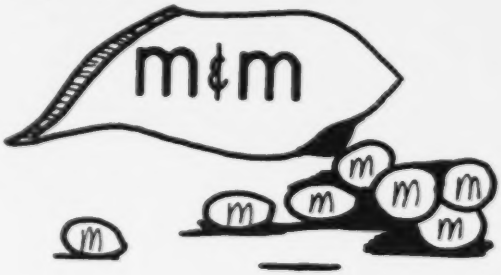
IX. **What the Students Will Do**
Refer to sections VII and VIII.

X. **Discussion**
See questions on student worksheets.

XI. **Extensions**
1. Students can test the larger bags of M & M's to see if similar patterns emerge.
2. Students can test "generic brand M & M's" and compare with M & M's.
3. Students can write their own investigation based upon another type of candy or food product.
4. Refer to Project Aims investigation "What's in the Bag."

XII. **Curriculum Coordinates**
Language Arts
1. Write to the M & M/Mars Company, Division of Mars, Inc., Hackettstown, New Jersey 07840.
2. Write a comic strip showing how M & M's are made.

Social Studies
1. Find out the history of M & M's.
2. Contact the appropriate government agency to gain information about regulations governing weights of foods.



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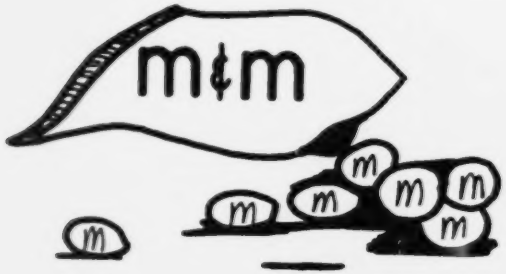
NAME _____

CANDY FACTORY FACTS

WEIGHT



PREDICTION

	HUNDREDS	TENS	ONES
GREEN			
ORANGE			
YELLOW			
LIGHT BROWN			
DARK BROWN			
TOTAL			

60

ACTUAL

	HUNDREDS	TENS	ONES
GREEN			
ORANGE			
YELLOW			
LIGHT BROWN			
DARK BROWN			
TOTAL			

61

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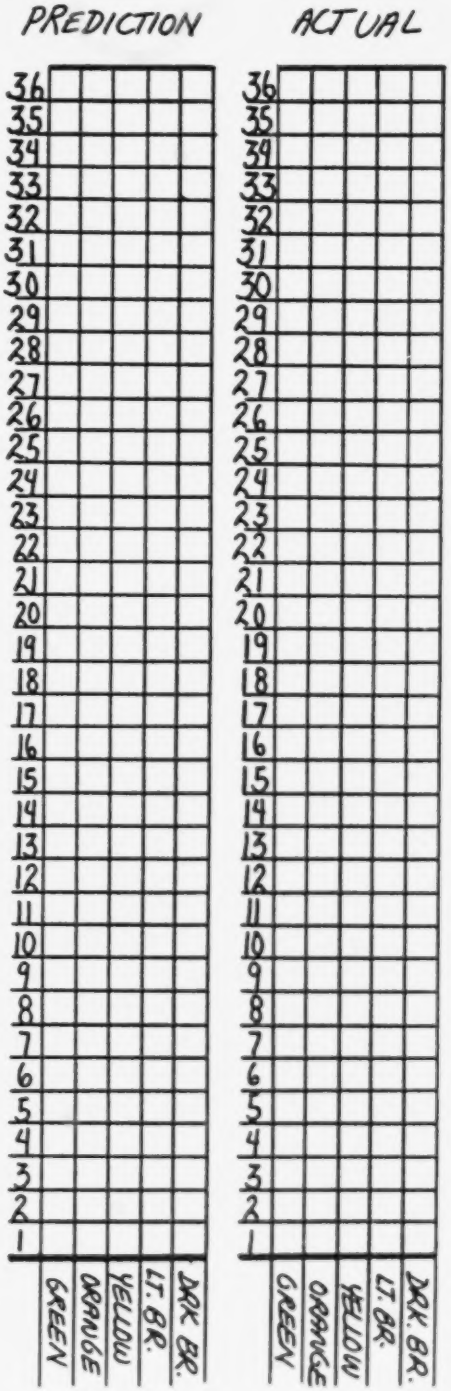
WEIGHT



1. WHAT WAS THE TOTAL WEIGHT OF YOUR PACKAGE OF M&M'S?

_____

2. WHICH COLOR WEIGHED THE MOST?

_____

3. WHICH COLOR WEIGHED THE LEAST?

_____

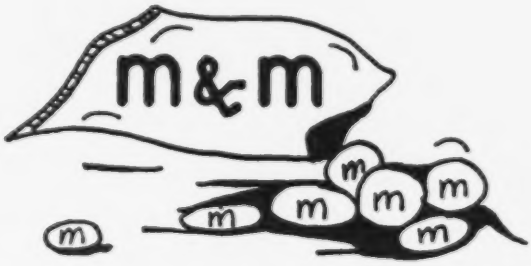
4. HOW MUCH DOES ONE M&M WEIGH?

_____

5. USE YOUR TABLES FROM PAGE 1 TO COMPLETE THE GRAPHS!

6. DO YOU THINK THAT ALL BAGS OF M&M'S ARE THE SAME?

7. FIND OUT! COMPARE GRAPHS WITH 4 OTHER STUDENTS!



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COMPARING FACTS

GREEN	ORANGE	YELLOW	LT BROWN	DRK. BROWN
31				
30	30	30	30	30
29				
28				
27				
26				
25	25	25	25	25
24				
23				
22				
21				
20	20	20	20	20
19				
18				
17				
16				
15	15	15	15	15
14				
13				
12				
11				
10	10	10	10	10
9				
8				
7				
6				
5	5	5	5	5
4				
3				
2				
1				

TOTAL
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2

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Looking at Mr. Goodbar

I. **Topic Area**
Food Patterns

II. **Introductory Statement**
Students will look for consistencies in commercial food packaging.

III. **Math Skills**
a. Whole number computation (addition, subtraction)
b. Finding averages
c. Measurement in metric units
d. Estimating
e. Using a calculator

Science Processes
a. Measuring
b. Estimating
c. Gathering and recording data
d. Generalizing

IV. **Materials**
Metric scales
Hershey's Mr. Goodbar (one per student)

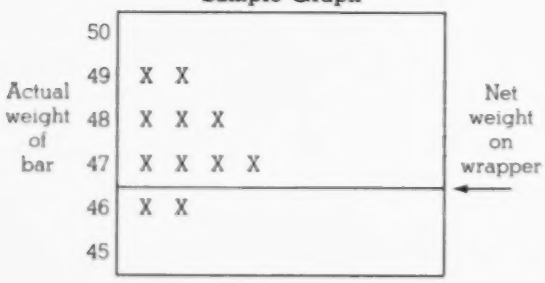
V. **Key Question**
Are all Mr. Goodbars created equally?

VI. **Background Information**
Actual weight of candy bar has been rounded to the nearest gram.

VII. **Management**
1. This activity will take approximately 40 minutes.
2. Be sure to count *all* peanut pieces.
3. If you don't have enough scales for each student, the data does not have to be collected in the order shown on the worksheet. The students may also work in groups.

VIII. **Procedure**
1. Purchase Mr. Goodbars.
2. Prepare weigh stations.
3. Prepare a chart for a classroom graph showing the actual weights.
4. Score a line on the graph to represent the net weight on the wrapper.

Sample Graph



IX. **What the Students Will Do**
Before passing out the candy bars, have the students estimate the number of peanuts in a bar and record it on their worksheets.
To guide students in their work, write the following outline on the chalkboard.
1. Count actual number of peanuts and record.
2. Calculate the average number of peanuts in four bars.
3. Complete the bar graph using the actual number of peanuts in four individual bars.
4. Weigh unwrapped candy bar and record.
5. Find the difference between the actual and the net weight.
6. Do rubbings of the front and the back of the candy bar.

X. **Discussion**
1. Does the number of peanuts affect the weight of the candy bar? (answers will vary)
2. Is there a consistent number of peanuts in a bar? (no)
3. Do you see any consistencies in the packaging? (answers will vary)
4. Were any actual weights less than the net weight? (according to consumer law, there should not be any otherwise the merchandise is not marketable)
5. Some foods are packaged "by weight, not volume," what does that mean? (while the contents might not fill the container, it does meet or exceed the specified weight)

XI. **Extensions**
Check other foods for consistencies in packaging: raisins, M & M's, Skittles, potato chips, etc.

XII. **Curriculum Coordinates**
Language Arts
1. Write a letter to the Hershey Plant in Hershey, Pennsylvania or Oakdale, California and ask about the procedure for making Mr. Goodbars and other candy bars. Ask for specific information.
2. Research the growing cycle of a peanut and write a report.

Physical Education
1. Mr. Goodbar race. Students pack together in a "peanut cluster" and race across the field.
2. Place a peanut on a spoon and run across a field. Relay race optional.

Home Economics
Make peanut butter by placing peanuts in a blender. Make sure peanuts are not dry roasted.

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Looking at **Mr. Goodbar** _____ Name

Actual weight of unwrapped candy _____ grams

Net weight on wrapper 47 grams

Difference (subtract) _____ grams

Make a rubbing of your candy bar~

Front Side

Back Side

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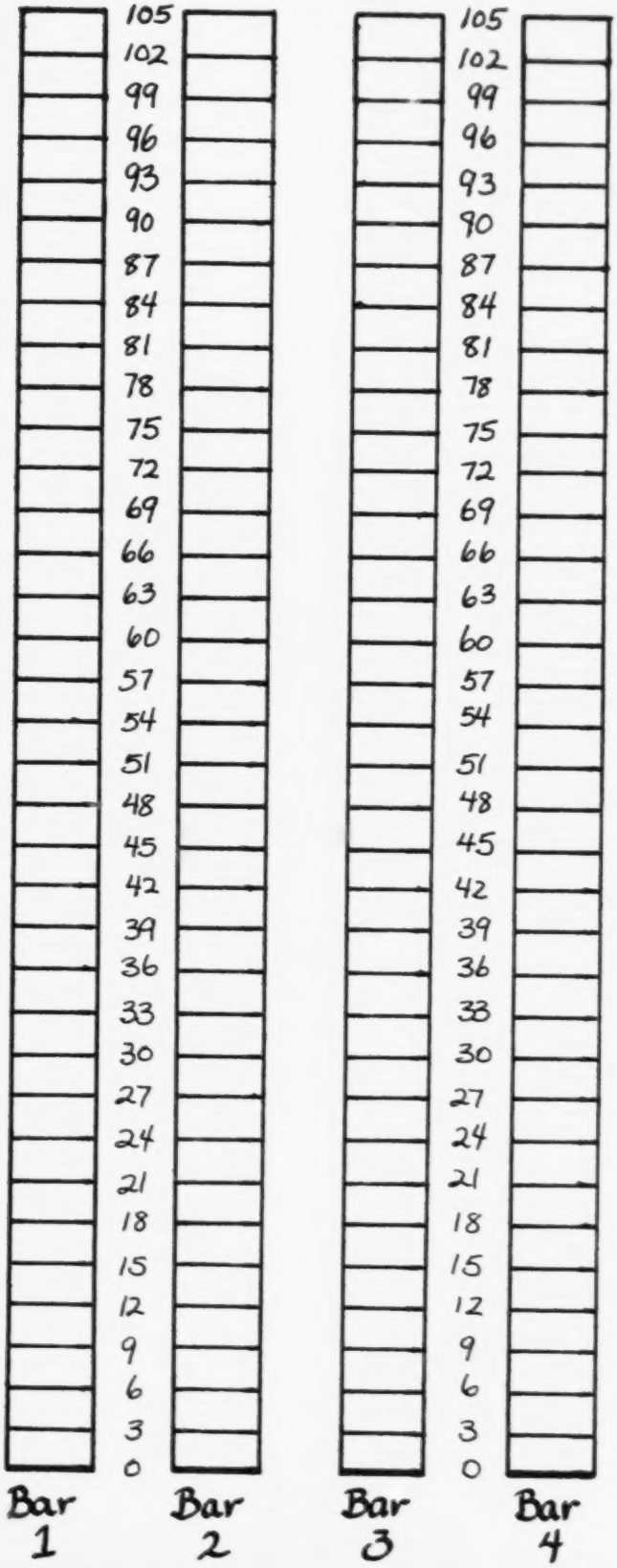
Looking at Mr. Goodbar



Name _____

My estimated number of peanuts _____

Actual number of peanuts _____

Find the average number of peanuts in four bars

Bar 1 _____

Bar 2 _____

Bar 3 _____

Bar 4 + _____

Total (sum) _____

4 ⟌ _____

Average _____

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KOOKIE KAPERS

I. **Topic Area**

Food

II. **Introductory Statement**

The students will find out if all boxes of McDonald's Chocolaty Chip Cookies are the same.

III. **Math Skills**

a. Counting & observing
b. Graphing
c. Observing
d. Problem solving

Science Processes

a. Measuring
b. Comparing data
c. Predicting
d. Recording data

IV. **Materials**

1. Six boxes McDonald's Chocolaty Chip Cookies
2. Six metric scales (if possible)
3. Student worksheets

V. **Key Question**

Does a company always create "all things equal?"

VI. **Background Information**

According to the Bureau of Weights and Measures, the weight stated on the box cannot be less than is specified. On the other hand it can and usually is more.

One ounce equals 30 grams.
Two ounces equal 60 grams.

VII. **Management Suggestions**

1. Divide the class into 6 groups. Give each group a metric balance scale and a box of McDonald's Chocolaty Chip Cookies.
2. Choose a group captain for each group.
3. Hand out the student worksheet and graph.
4. Estimated time is 45 minutes.

VIII. **Procedure**

1. Discuss with the class the fact that the weight on the box of cookies is 2 ounces or 56 grams. This is the weight of the cookies without the box.
2. Estimate before passing out the boxes of cookies.

IX. **What the Students Will Do**

1. Estimate the weight of cookies. (with box)
2. Weigh cookies and record. (with box) Find difference.
3. Estimate the weight of cookies. (without box)
4. Weigh cookies and record. (without box) Find difference.
5. Estimate how many cookies you think are in the box.
6. Count cookies in box and record. Find difference.
7. Divide the weight of cookies (without box) by the number of cookies in the box to get the average weight of each cookie.
8. Have group captains share information with the class.
9. Graph the results of all 6 groups. Graph cookies with box and without box.

X. **Discussion**

1. What is the ratio of cookie to box of cookies?
2. Are the chocolate chips equally distributed in each cookie?
3. How much does the cellophane wrapper weigh? (one gram)

XI. **Extension**

1. Write to McDonald's Chocolaty Chip Cookies: Keebler Co., Elmhurst, Illinois 60126.
2. Use boxes to make puppets.
3. Write a story:
   a. If I were a chocolaty chip cookie...
   b .The travels of a chocolate chip...

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KOOKIE KAPERS

Name

Group	Weight in grams (with box)			Weight in grams (without box)			Number of Cookies			Weight of one Cookie
	estimate	actual	difference	estimate	actual	difference	estimate	actual	difference	☆ ☆
#1										
#2										
#3										
#4										
#5										
#6										

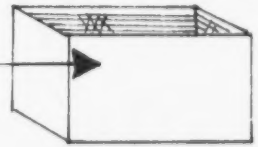
69

☆ ☆ divide weight of cookies by the number in box

Average number of cookies per box

A. Add number in all boxes.

B. Divide by the number of boxes.



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Name _____

KOOKIE KAPERS

A = Weight with box

71 B = Weight without box

	A	B
99		
96		
93		
90		
87		
84		
81		
78		
75		
72		
69		
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	A	B
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SWEAT IT OUT

I. **Topic Area**

Food dehydration

II. **Introductory Statement**

Students will learn about the comparative amounts of water in foods.

III. **Math Skills**

a. Measuring mass
b. Ordering
c. Addition
d. Subtraction
e. Multiplication

Science Processes

a. Predicting
b. Gathering and recording data
c. Controlling variables

IV. **Materials**

Scales and gram weights (for each group)
Waxed paper
5 foods—Choose a combination of fruits and vegetables such as potatoes, carrots, squash, eggplant, apples, bananas, persimmons, pears, melons, etc.
Dinner knife (one per group)
1 sharp knife
Potato peeler (for teacher's use)
Cutting board

V. **Key Question**

Which food will lose the most weight? (answer varies)

VI. **Background Information**

Foods contain varying amounts of water, usually a surprising percent of their total weight. Fruits generally contain more water than vegetables.

VII. **Management**

1. Ask students to bring the foods, two of each kind to allow for mistakes (cutting below the weight wanted).
2. This activity will take about 60 minutes the first day. (predicting, cutting foods) Use groups of 5.
3. The second day (weighing and completing activity) will take about 45 minutes.

VIII. **Procedure**

1. Decide the target weight (all food pieces will be cut down to this) before doing the investigation.
2. Peel and cut large slices of each food for every group. Make sure the pieces weigh more than the target weight.
3. Set up scales and weights for each group.
4. Demonstrate how to cut a food piece, weigh, cut, weigh, etc. to get it to the right weight.
5. If necessary, assign each student to cut a particular vegetable in their group.

IX. **What the Students Will Do**

1. Students will predict which food will lose the most weight, ordering the other foods beneath it.
2. Student groups of 4-5 will trim prepared slices to the agreed upon weight, each being responsible for one food. (10 to 20 grams recommended). Weights may need to be double-checked.
3. Students will fill in the first three rows of the chart, multiplying weight times the number of groups. This will be the total weight being tested.
4. On the second day, students will record results from all the groups and add the totals for each food.
5. After transferring information to the boxes, students will subtract the Weight After Total from the Weight Before Total to find the Total Difference.
6. Students will write the foods in order of weight loss next to their predictions.

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X. **Discussion**

1. What are we doing to keep testing conditions the same? (These variables are being controlled:
   a. All foods are peeled.
   b. All foods should be roughly the same shape and size.
   c. All foods have two large sliced surfaces.)
2. How could the results change if these controls were not used?
   (All the variables deal with the amount of exposed surfaces, which will either speed or slow the drying process. This would make results uneven and inaccurate.)
3. What do foods lose when they are dried? (water)
4. Do fruits or vegetables contain more water? (usually fruits)
5. What food(s) do you think might beat the weight loss winner?
6. Since people are ⅔ water, how do we replace water we lose through sweating, etc.? (drinking liquids, eating foods)

XI. **Extensions**

1. Find the average loss of each food.
2. How fast would these foods get moldy if left out to dry longer? Study the molds.
3. Buy some dehydrated food such as backpackers use. Fix it and taste.
4. Find out about food the astronauts eat in space.

XII. **Curriculum Coordinates**

Language Arts

Word search: Find all the synonyms for "drying up." (evaporate, dehydrate, sweat, etc.)

Social Science

Find out how people preserved food in colonial times.

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SWEAT IT OUT

WHICH FOOD WILL LOSE THE MOST WEIGHT?

PREDICTION	ACTUAL
1 _____	1 _____
2 _____	2 _____
3 _____	3 _____
4 _____	4 _____
5 _____	5 _____

CUT EACH FOOD SLICE TO THE SAME WEIGHT.

LET PIECES DRY FOR TWO DAYS.

		1	2	3	4	5
FOOD						
WEIGHT BEFORE	PIECE					
	# OF GROUPS					
	TOTAL (X)					
WEIGHT AFTER	A					
	B					
	C					
	D					
	E					
	F					
	TOTAL (+)					

1	2	3	4	5
−				

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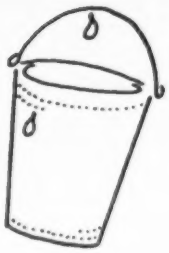
Orange You Amazed?



I. **Topic Area**
Evaporation

II. **Introductory Statement**
Students will learn the approximate amount of water in an orange.

III. **Math Skills**
a. Estimating
b. Measuring mass
c. Graphing
d. Whole number computation (subtraction)

Science Processes
a. Recording data
b. Observing
c. Measuring
d. Interpreting data

IV. **Materials**
Scales
Oranges
Weights (enough to weigh 300 g.)
Paper towels

V. **Key Question**
How many oranges would it take to make a glass of orange juice?

VI. **Management**
1. The investigation will take 30 to 40 minutes for two (2) days. (skip a day in between for drying)
2. Oranges will be placed on a paper towel. This towel should not be changed during the course of the investigation.
3. Use only the edible parts.
4. Only count full orange sections. (when in doubt ask "Is this part edible?")

VII. **Procedure**
1. Prepare a chart for making a class bar graph of moisture loss.
2. Make sure students know how to use a scale.
3. Purchase oranges or have students bring them in. Be sure to have one for each student.

VIII. **What the Students Will Do**
1. Estimate the number of sections in an orange and record.
2. Peel the orange and separate sections.
3. Place orange sections on a paper towel.
4. Count and record actual number of *edible* sections.
5. Estimate the weight of the peeled orange sections.
6. Find the actual weight of the orange sections and paper towel.
7. Place on shelf for 2 days.
8. After 2 days estimate the weight of the orange.
9. Find the actual weight of the orange sections and the paper towel.
10. Calculate the moisture lost due to evaporation.
11. Complete individual graphs of moisture loss.
12. Help teacher complete class bar graph.

IX. **Discussion**
1. Where did the weight go? (It evaporated.)
2. Does this give a good idea of the amount of water in an orange? (Answers will vary. The main conclusion should be no because there is still water present in the orange.)
3. Why do the number of sections vary? (The number of orange sections is determined by the genes in the orange. Those specific genes haven't been isolated as the number of orange sections really doesn't matter to the producer.)
4. What would happen if we didn't peel the orange? (The orange would not lose as much moisture.)
5. How did the scale help determine the moisture lost? (By finding the difference in the weights, we could determine the weight loss due to evaporation.)

X. **Extensions**
1. Continue drying orange until all moisture is lost.
2. Find the amount of moisture in other fruits: apples, lemons, watermelons, etc.
3. Place objects in an oven for quicker evaporation.
4. Compare the rate of evaporation in different places and temperatures: shade, winter, summer, sun, closet, etc.
5. Make a solar oven.
6. Find out how much water dehydrated food will absorb.
7. Find the circumference of the orange.
8. Calculate the average moisture loss for the entire class.

XI. **Curriculum Coordinates**
Language Arts
1. Write a story, from the oranges' point of view, about how it feels to be evaporated.
2. Write letters to dehydration companies asking about the dehydration process.

Social Studies
1. Find the growing location for the fruit being studied. How does the climate affect the growth?

Art
1. Make a Papier Mache model of your fruit "before" and "after".
2. Draw a sequence story showing the life of the fruit from start to finish.

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Orange You Amazed?

Name _____

Estimated number of sections _____

Actual Number _____

Difference _____

Estimated Orange Weight and paper

Actual Orange Weight and paper

DAY 1 _____ _____

DAY 2 _____ _____

Moisture Loss

77

DAY 1

Estimate Weight

Weigh sections and paper

Record Actual Weight

DAY 2

Estimate Weight

Weigh sections and paper

Record Actual Weight

Find the difference between the two actual weights

over 50				
48				
46				
44				
42				
40				
38				
36				
34				
32				
30				
28				
26				
24				
22				
20				
18				
16				
14				
12				
10				
8				
6				
4				
2				

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WATER IN APPLES

I. **Topic Area**
The amount of water in an apple.

II. **Introductory Statement**
The students will discover the amount of moisture in an apple.

III. **Math Skills**
a. Measurement-grams
b. Addition
c. Subtraction
d. Averages
e. Graphing

Science Processes
a. Recording data
b. Observing
c. Interpreting data

IV. **Materials**
3 apples (1 whole, 1 peeled, 1 chopped)
balance scales
gram weights or centicubes
student worksheets

V. **Key Question**
How will the apples change after sitting on the windowsill for 4 days?

VI. **Background Information**
The chopped apple should lose the most moisture, since it has more area exposed. The peeled apple should show a significant loss. The whole, unpeeled apple should show minimal difference.

VII. **Management**
1. Apples should be uniform in size.
2. Prepare apples in front of the class.
3. Record weight of peeled apples and chopped apple *after* preparation.
4. Allow 5 consecutive days for this investigation.
   a. Monday (45-60 minutes) is used for introduction, explanation, and preparation of apples.
   b. Tuesday, Wednesday, and Thursday will take 15-20 minutes each day.
   c. Friday (45-60 minutes) is used for conclusion and final worksheets.
5. Weighing and recording should occur every day at same time.
6. It is helpful to have 2 students act as recorders for the entire week.

VIII. **Procedure**
1. Set up balance scale and gram cubes.
2. Weigh whole apple A and record weight.
3. Weigh peeled apple B and record weight.
4. Weigh chopped apple C and record weight.

IX. **What Students Will Do**
1. All students will record daily weights for each apple.
2. Students will figure weight loss for each apple from previous day.
3. Students will graph each apple's daily weight.
4. Students will average each apple's daily moisture loss (on Friday).
5. Students will interpret how the apples lost different amounts of moisture.

X. **Discussion**
1. Why didn't apple A lose any moisture? (The skin prevents moisture from escaping and it protects the fruit.)
2. Did apple C lose more moisture than apple B? Why? (Apple C lost more moisture than apple B because it had more sides exposed than apple B.)
3. What other fruits might have similar results? Why? (Oranges, bananas, peaches,...any fruit that has a peel.)

XI. **Curriculum Coordinates**
History
1. Read the story of *Johnny Appleseed.*
Language Arts
1. Write a daily journal during the investigation as seen through the eyes of one of the apples.
Cooking
1. Make applesauce.
Art
1. Applehead dolls.
2. Draw a mural of the apple tree's growth.

XII. **Extension**
1. Use this procedure with a different fruit. Compare the results of both studies.
2. Study the life cycle of the apple tree.

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NAME _____

WATER IN APPLES

	A	B	C
MONDAY			
TUESDAY			
DIFFERENCE			
TUESDAY			
WEDNESDAY			
DIFFERENCE			
WEDNESDAY			
THURSDAY			
DIFFERENCE			
THURSDAY			
FRIDAY			
DIFFERENCE			
TOTAL LOSS			

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NAME _____

WATER IN APPLES

WHAT DID APPLE A WEIGH ON MONDAY? _____

WHAT DID APPLE A WEIGH ON FRIDAY? _____

PERHAPS YOU CAN EXPLAIN THAT! _____

_____

WHAT DID APPLE B WEIGH ON MONDAY? _____

WHAT DID APPLE B WEIGH ON FRIDAY? _____

I CAN'T BELIEVE IT!! WHAT HAPPENED?! _____

_____

WHAT DID APPLE C WEIGH ON MONDAY? _____

WHAT DID APPLE C WEIGH ON FRIDAY? _____

INTERESTING! TELL ME WHAT HAPPENED! _____

_____

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NAME _____

APPLES

FIND THE AVERAGE AMOUNT OF MOISTURE THAT APPLE B LOST DAILY.

TUESDAY _____

WEDNESDAY _____

THURSDAY _____

FRIDAY + _____

TOTAL _____ ÷ 4 = _____
AVERAGE

FIND THE AVERAGE AMOUNT OF MOISTURE THAT APPLE C LOST DAILY.

TUESDAY _____

WEDNESDAY _____

THURSDAY _____

FRIDAY + _____

TOTAL _____ ÷ 4 = _____
AVERAGE

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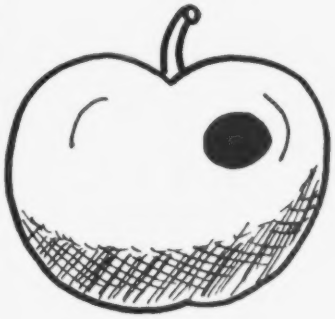
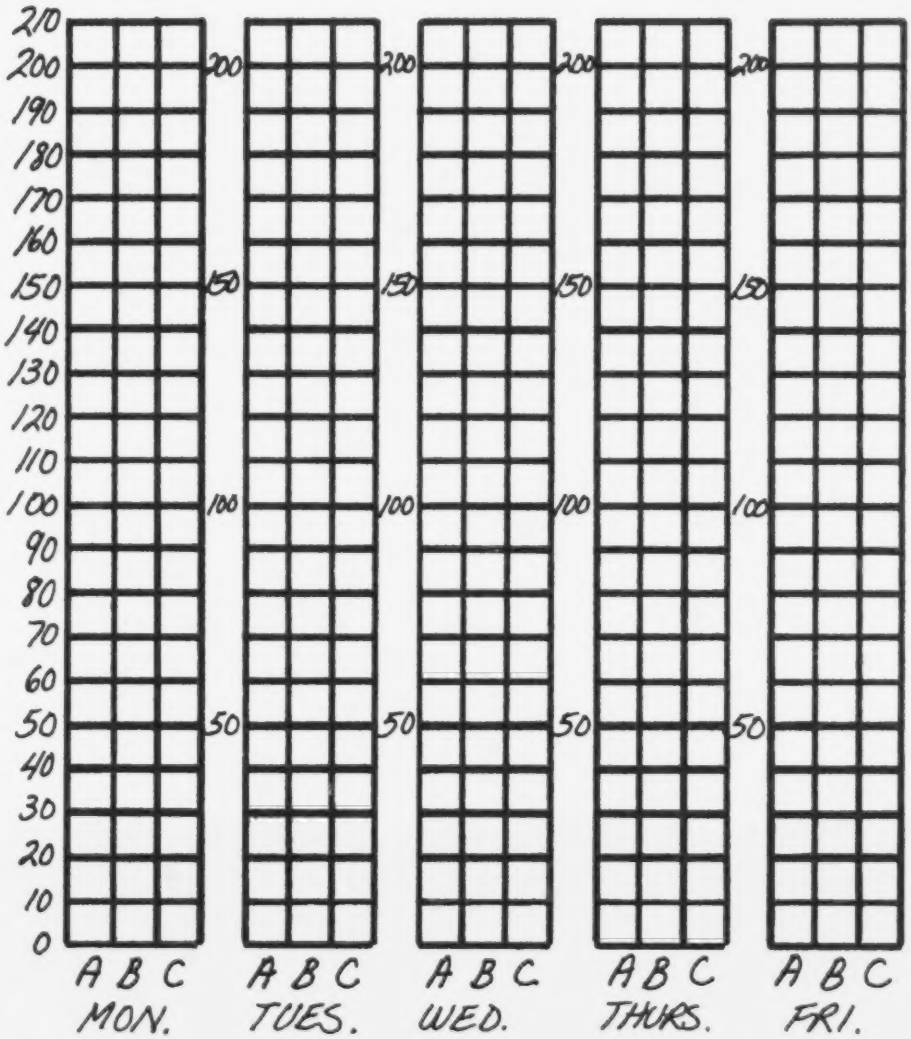
NAME _____



APPLES AND GRAPHING



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INCREDIBLY EDIBLY NUTRITIOUS

I. **Topic Area**
Food

II. **Introductory Statement**
Students will separate and weigh the inedible and edible portions of their food sample and calculate the percent which is edible. Students will work in groups of five for averaging and graphing.

III. **Math Skills**
a. Measuring (weight)
b. Calculator usage
c. Percent
d. Averaging
e. Graphing

Science Processes
a. Gathering and recording data

IV. **Materials**
Calculators
Any kind of food, canned or fresh, which can be separated into edible and inedible portions.

V. **Key Question**
How much do you actually get to eat?

VI. **Background Information**
Most fresh fruits and vegetables can be separated into parts we eat and don't eat. Many canned foods, such as string beans, have the same quality. The student worksheet provided allows you to select the items of your choice to have your students test. It can be used over and over for many different kinds of foods and can form the foundation of a unit on being an effective consumer.

VII. **Management**
1. This activity should take a student approximately 30 minutes to complete. Class time would be dependent upon the number of scales and calculators available.
2. This activity makes a good learning center once students have run through the lesson as a class and understand the procedure.

VIII. **Procedures**
1. Pose the key question and discuss foods we eat and what part of those foods we don't eat.
2. Demonstrate the use of the scales.
3. Demonstrate the use of the calculator and the formula located on the student worksheet.
4. Have students break into groups of five to find the average percent of edible food.
5. Have groups share their average figures to complete the graph.

IX. **What the Students Will Do**
1. Students will weigh their food samples, then separate into edible and inedible parts. Students will weigh the inedible portion.
2. Students will record the total weight of their food sample and the weight of the inedible portion in the appropriate squares of the student worksheet. Using a calculator, students will complete the equation to obtain a figure which tells the percent you actually get to eat.
3. Students will break into groups of five and share data for the averaging section.
4. Each group will then share data with other groups to complete the class graph.

X. **Discussion**
1. How much do you throw away?
2. How much do you eat?
3. Can you name some fruits or vegetables that have more thrown away? Less?

XI. **Extensions**
Have students figure the edible price per pound. One pound = 453 grams

XII. **Curriculum Coordinates**
Social Studies
1. Students can study the growing seasons and growing locations of their test samples.

Art
1. Students can make food prints.

Health
1. Students can study the food values and food groups of their test samples.

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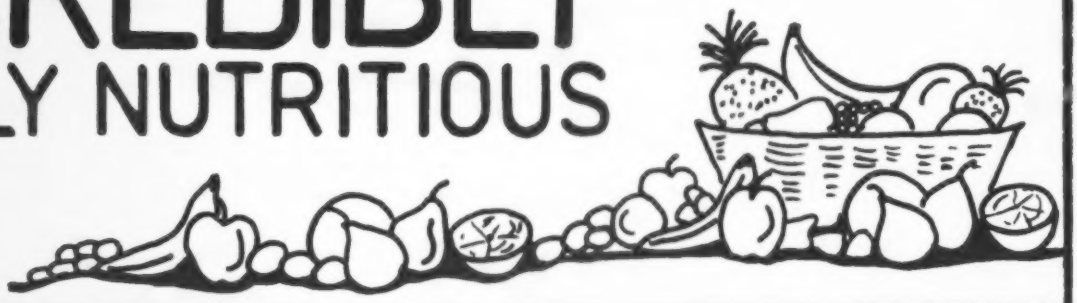
INCREDIBLY EDIBLY NUTRITIOUS

NAME _____



TEST SAMPLE _____

1. WEIGH YOUR TEST SAMPLE TO FIND YOUR TOTAL WEIGHT. RECORD BELOW.

2. SEPARATE YOUR TEST SAMPLE INTO EDIBLE AND INEDIBLE PARTS.

DRAW YOUR SAMPLE

3. WEIGH THE INEDIBLE PORTION OF YOUR SAMPLE AND RECORD BELOW.

4. USE A CALCULATOR AND THE EQUATIONS BELOW TO FIND OUT HOW MUCH YOU ACTUALLY GET TO EAT.

[ ] ÷ [ ] = X [100] = [ ] [1][0][0]

INEDIBLE PORTION TOTAL WEIGHT % INEDIBLE

— [ ][ ]

HOW MUCH DO YOU ACTUALLY GET TO EAT? → [ ][ ]

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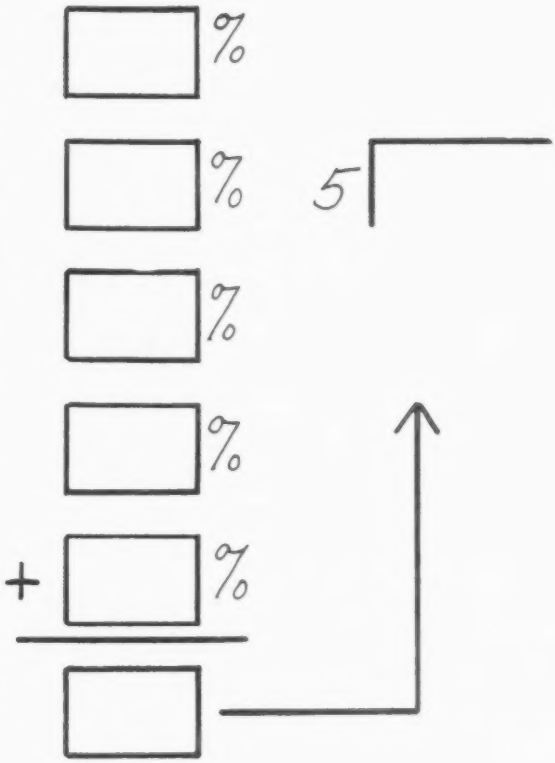
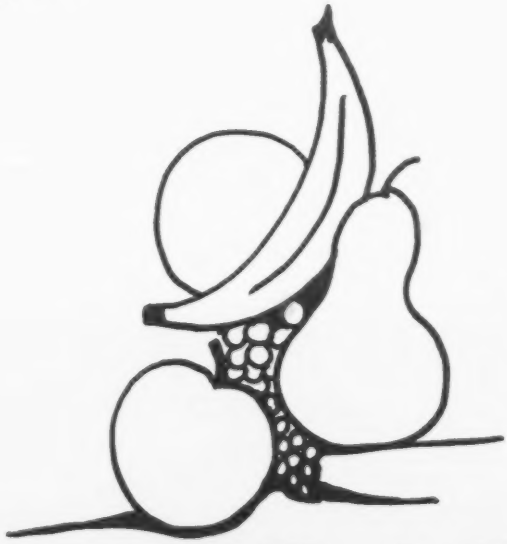
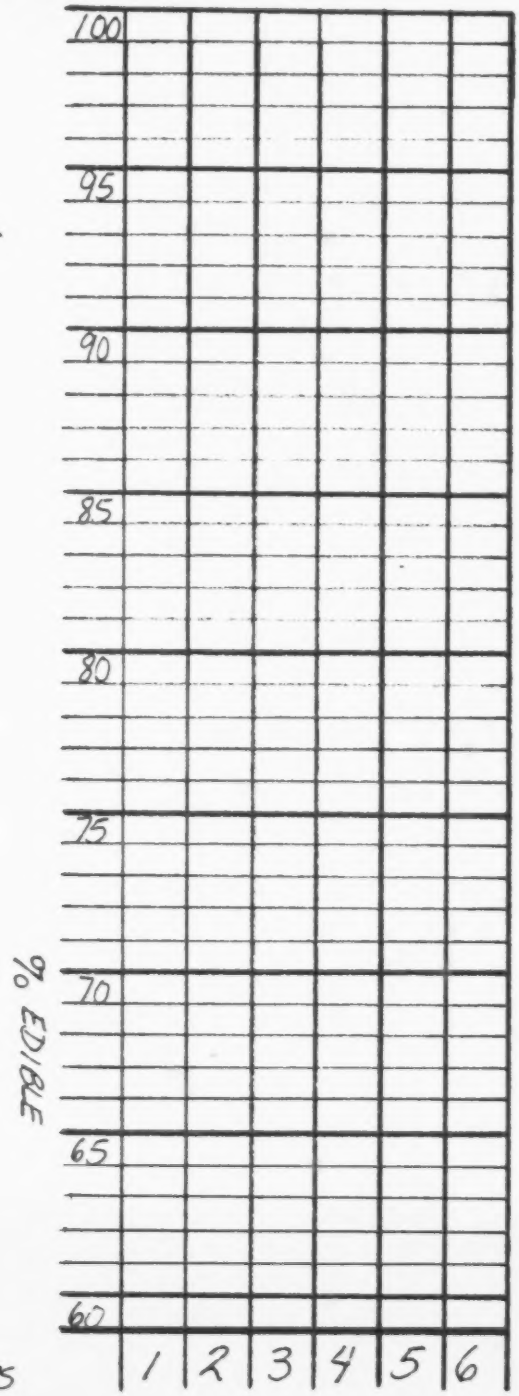
COMPARE EDIBLES BY AVERAGING AND GRAPHING







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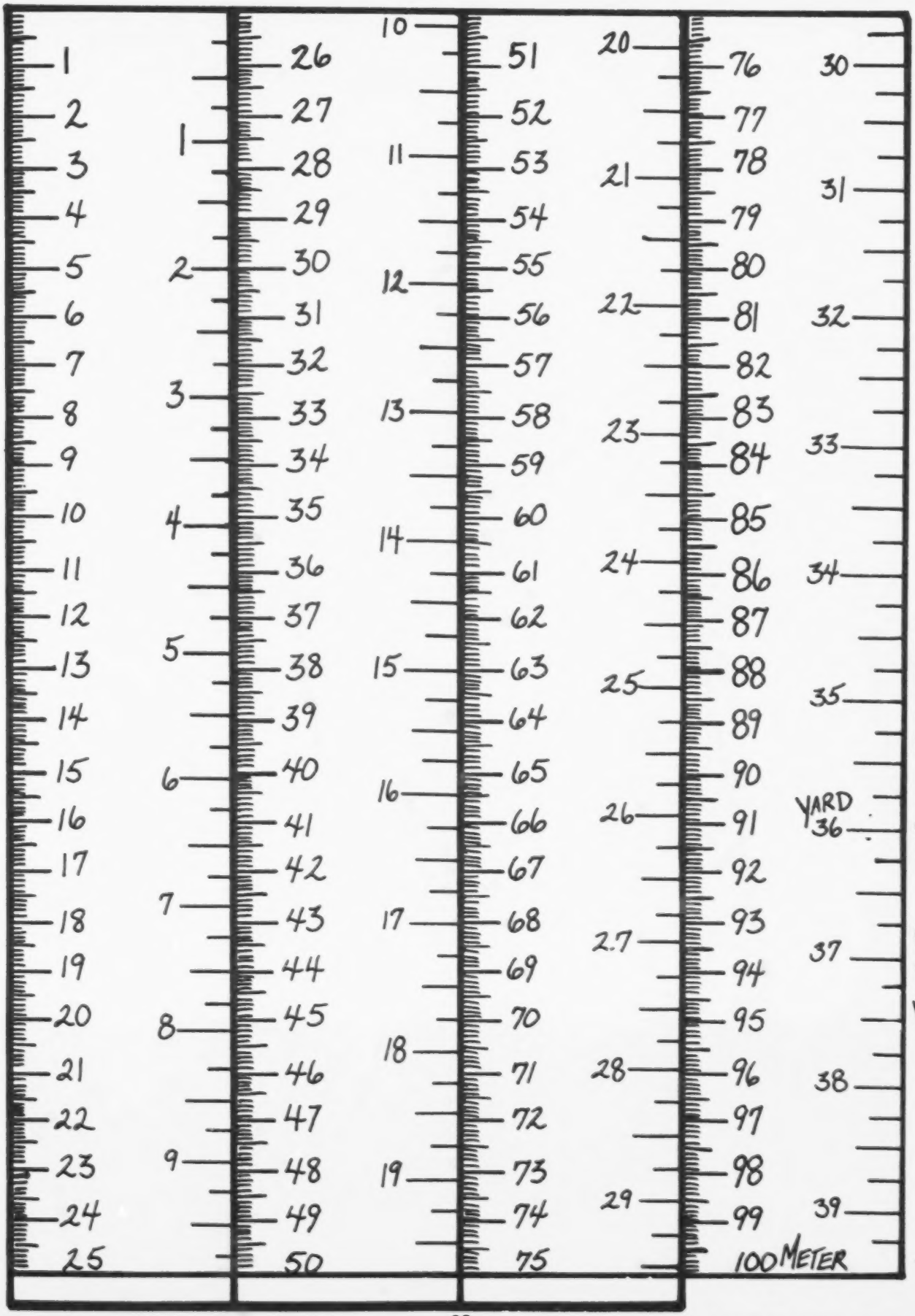

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